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THE PILOTS' BOOK OF EVEREST



Lafayette

SQUADRON LEADER THE MARQUESS OF DOUGLAS & CLYDESDALE, A F C, M P,
First Pilot, Houston-Mount Everest Expedition, 1933

THE PILOTS' BOOK OF EVEREST

BY

SQUADRON LEADER THE MARQUESS OF DOUGLAS
AND CLYDESDALE, A.F.C., M.P.

AND

FLIGHT LIEUTENANT D. F. M'INTYRE

With a Preface by

Lt.-Col. The Rt. Hon. The Lord Tweedsmuir, G.C.M.G., C.H., D.C.L., LL.D.
Governor-General of Canada

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THIS BOOK
IS
GRATEFULLY DEDICATED
TO THE
BRITISH AIRCRAFT INDUSTRY

■

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P R E F A C E

I gladly accept the invitation of my friend, Lord Clydesdale, to contribute a few words of preface.

The history of the flight over Everest has already been written, mainly from the point of view of an elaborately organized scientific enterprise. Its technical apparatus and some of its scientific results have been fully described. This is the "pilots'" story, in which the two pilots, Lord Clydesdale and Flight Lieutenant M'Intyre, set down their actual experience in the most critical part of the business. It is the work of young men who have a quick eye for the romance of the enterprise; and the humours and vicissitudes of the journey to India, and of the preparatory work at Purnea, are most vividly described. But especially it is a story of the actual flights over the mountain, the unforeseen difficulties and the sudden calls upon the pilots' fortitude and judgment.

A certain amount of publicity was part of the bargain, and the writers accepted the necessity. But no men ever desired notoriety less. Their minds were always on their task, and they prepared themselves for it with an austere exactitude. They never forgot the motto of the expedition's leader, Air Commodore Fellowes: "Do your thinking on the ground." It was imperative, they write, "that we should not find ourselves nonplussed in an emergency in the air. We had not simply to know what to do, but to be reasonably sure that we should do it almost automatically."

This strenuous training was their salvation, for in both great flights they shaved the very edge of disaster, and won

PREFACE

though only by discipline and nerve and trained judgment. This part of the book makes a fascinating story.

But their business was not adventure but practical results, and they never lost sight of their main duty. That was the reason for the second flight, which might be described as a piece of conscientious insubordination. By a stroke of good fortune—almost the only occasion on which the Fates relented—they were enabled to achieve the bit of difficult survey work which they had set themselves to complete.

The fine tale is told brilliantly and most modestly. The expedition was a happy company. "It would be hard to find a more efficient band," is the writers' tribute. It was a piece of audacious pioneering, which has left an indelible impression on the minds of the pioneers, an impression which they have succeeded in conveying to the reader. "To the pilots, the recollection of Everest is at once romantic and a little unreal. Something of the mystery has been overcome, and something of the unknown has been revealed; yet the Mistress of the World remains remote, immense and magnificent. The best thing that we could bring back was but a faint impression of her dignity and beauty."

TWEEDSMUIR.

Ottawa, *February*, 1936.

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CHAPTER I

APOLOGIA NOSTRA.

(Clydesdale)

The success of an expedition depends to a large extent on the friendship, ability and determination of its members to work together in harmony, each man doing his share. The Houston Mount Everest Flight Expedition is no exception to this rule; under the able leadership of Air Commodore Fellowes the most cordial co-operation existed between the members of the Expedition: every individual fully pulled his weight, all working together with a whole-hearted and most willing spirit. It is for this reason that I allowed my name to go forward as one of the authors of "First over Everest" although I cannot claim to have contributed anything more than one report of 500 words. Four months after our return, I contracted a chill which developed into pneumonia, putting me on the "sick list" for several months and preventing me from presenting my practical contribution to the book. I did not see proofs until the book was published and, in fact, I can claim only to be an author on the strength of the short account I wrote after the first main flight on 3rd April, 1933.

The other authors apparently thought it inadvisable to hold up the publication of the book, so that it would be available to the public by the end of the year 1933. This book is presented because we believed no adequate contribution to what has been published about this Expedition was made by or from the point of view of any of the pilots, who, after all, played an essential part in the undertaking. Air Commodore

Fellowes left the country for a lecture tour in America, and so saw no proofs before the book was published; but before he departed he wrote an account of his flight over Mount Kangchenjunga. M'Intyre has appeared once very briefly in print; Ellison has remained silent, and I have written brief reports on the two Everest flights. I feel that without a supplement by at least one of the pilots to what has already been written, the lessons learned would be incomplete and the accounts distorted.

It is not possible to avoid entirely repetition of events already described, but the same events described from a different angle by those who experienced them will tend to present them in a clearer light than that in which they have hitherto appeared. The Everest Flight was essentially purely an aviation project and not a mountaineering expedition. It is true that it was the first Flying Expedition whose direct object lay midst the mountains of the huge Himalayas. The pilots depended on their skill as aviators rather than relying on any knowledge of mountains, which they never professed to possess.

Flights had before been made over the foothills near the Everest region in aeroplanes not specially designed for high altitudes, and mostly at dates when few machines were capable of flying over the really high country where even the valleys are in places over 15,000 feet.

The objects of the expedition in the material sense can be said to have been, firstly, to show that a British aeroplane with a British crew could easily fly over the highest point in the world; secondly, to make a survey by means of oblique and vertical photographs of some of the unknown country south of Mount Everest; and thirdly, to gain some scientific knowledge of interest, with reference to meteorological and flying conditions over high mountains.

There were two aspects of the scheme. There was the scientific side and then there was an element of romance. The undertaking was an adventure, for there existed at least in some measure the idea that the unknown was being probed. Information was available about flying at high altitudes and over less formidable mountains. Members of previous climbing expeditions kindly described to us the conditions they had hitherto encountered. However, the actual conditions to be met over the high Himalayas from the flying point of view to a certain extent were bound to remain a mystery. The unknown element appealed to public imagination, which caused the risks of the Everest Flight to be very much exaggerated. There was, of course, the possibility of failure of either the engine, air-frame, or essential equipment, but this was improbable. The engine and air-frame were well and reliably constructed and were to be handled with utmost care until the main flight. The risk of failure from these sources could be regarded as negligible. Personally, I was not so confident about the heated clothing and oxygen equipment, but all components had been thoroughly tested and the risk was comparatively small and had been reduced to a minimum. On the other hand, the human element, which was a problematical factor, was not strained to the point we thought it might have been, and no difficulties arose in this connexion except in the case of Bonnett, whose unpleasant experience is told of later on. Moreover, the flying personnel had already undergone tests before leaving England and were thoroughly fit physically.

The time factor has proved one of the most vital obstacles in all attempts at the conquest of Everest. If the adventurer can wait patiently, in constant readiness to make the assault, Everest sooner or later presents itself in a mood favourable to his enterprise, for rare days which offer clear skies and gentle

winds do occasionally occur in the Himalayas. It is true that we were at Purnea for one month only, but in that time we wasted no opportunity which was even approximately suitable for our purpose, and in that period only three main flights were made—two of them in difficult conditions.

With reference to the film "Wings over Everest," I am of the opinion that the best advantage was not taken of the material available. The British Gaumont Corporation took a great deal of trouble and went to considerable expense in sending out experienced operators with whom we were all on the best of terms and who produced some magnificent pictures.

There appeared to be no clear idea as to what type of film should be produced. Personally, I strongly objected to turning what should have been a purely scientific film into a popular one which was bound to create a wrong impression. It is doubtful whether it is ever possible to combine satisfactorily a scientific and a popular film in one. No doubt there is a point of view which would consider success to have been achieved had we concentrated on a purely popular production. It would have been necessary to have secured the services of a good story writer who would have written the scenario, embodying a romantic aspect, and stressing the sensational side rather than the truth. I have been informed that a film of this kind would have presented a good selling proposition.

But this was not the pilots' viewpoint. In our opinion the whole value of the film would begin and end by depicting a true account of our activities as they took place. I believe that a film of this kind would not only have been appreciated properly by the public, but be of scientific interest. It should, however, have been shown shortly after the expedition returned. The film that was actually produced in its finished


form proved to be neither the one thing nor the other. It depicted film shots taken on several flights each with different weather conditions, all shown as though they were taken on the one flight. The two Gaumont air photographers produced truly magnificent material, possibly the best film pictures ever taken of high mountains, but considering what foundations for a perfect production there were, the finished film was very disappointing. Personally, I found the uncut film a great deal more interesting than the completed article, and it is regrettable that these remarkable results, which were available and which demonstrated what pictures could have been produced by Gaumont efficiency, should have been indiscriminately jumbled up with lesser and more common subjects.

At the same time as our preparations were being made, other plans were also in progress for a climbing expedition organized by the Mount Everest Committee of the Royal Geographical Society and the Alpine Club, whose object focussed on the same point. Personally, I should have liked there to have been only one expedition consisting of a climbing party and a flying party, each branch in touch and collaborating with the other by wireless and giving mutual assistance.

It is possibly not always realized that the aircraft taking part in the Everest Flights flew easily over ground which has never been trodden by the feet of man, and this is a point which can be said of very few significant parts of the globe, with the exception of certain areas in the Antarctic. In their essence, therefore, the three flights over the Himalayas constituted a remarkable achievement of what aircraft can accomplish without difficulty.

I remember thinking, as we flew so easily and in such comparative comfort over this immense uncharted region,

of the tremendous courage and tenacity of purpose which is required by those valiant climbers who have striven so often and with such undaunted spirit, to reach the summit of the world. While I write these lines, another Everest Expedition is now on its way to climb this inimitable peak, and as humble authors we send our sincere good wishes for their complete success.



CHAPTER II

THE WAYS AND MEANS

(Clydesdale)

It is probable that neither M'Intyre nor I would have taken part in this expedition but for the state of politics in Great Britain in the year 1932—an amusing reflection in view of the political considerations which drew Lady Houston into the project as backer. It will be remembered how the National Government had swept the constituencies in the General Election of 1931, coming into office with an enormous majority so that within a few months the back bencher was apt to feel that one individual counted for little among so many and that he might be as usefully engaged for a few months in examining the India question on the spot. This idea was simmering in my mind when I learned from Col. John Buchan in the early part of 1932 of the plan formulated by Lt.-Col. L. V. Stewart Blacker and Colonel P. T. Etherton for a survey flight over Everest. The two ideas came together so naturally that I at once volunteered to serve as pilot and my offer was accepted. A committee was in process of formation and I joined it, but the project at that time was very far from realization. The financial side, as in all such cases, proved difficult. There were many committee meetings during the spring, summer, and autumn, but in the absence of financial backing, no definite steps could be taken. Many schemes have failed of realization after careful planning through lack of funds.

During the last few years many exciting enterprises had been laid before me by enthusiasts of all sorts. They were of a great variety, some erratic and quite impossible, others

sound but obstructed by many difficulties. Some of the proponents were intelligent and of the highest integrity, some were stupid and inclined to allow hope to override their judgment. They told me of great intrigues, industrial inventions, of foreign concessions and great treasures to be had, of huge international and counter-revolutionary movements and many adventurous projects to be made most frequently by flying expeditions. The world is full of ideas of this type, and many men receive such proposals. No doubt they are usually dismissed without a second thought. On the other hand, a few of the less cautious are sometimes caught, compromised and come off badly from what at first seemed a splendid opportunity.

I have always been interested and carefully considered every enterprise laid before me, and it may be that that Scottish caution which is my heritage has kept me from burning my fingers on more than one occasion. The scheme to fly over Mount Everest appealed to me, but I viewed it much in the same way as the other ventures—to be carefully considered but not to be rushed at blindly.

The project was still under discussion and the form it was to take was far from settled when, in September, the tale of the share I had agreed to take in it leaked out. A few days before I had had what seemed to me a fruitless interview with Lady Houston. She had not actually declined to back the undertaking, but she had not given me much hope and I thought that we should have to seek another patron. Then, on the day of the Oban Gathering, came the announcement in the Scottish newspapers that I was to share a hazardous adventure in the Himalayas. This announcement was premature, not only in the sense that the plans had hardly begun to take shape, but also in view of the fact that I had not felt at liberty to take into my confidence those to whom I

owed special consideration. Two results emerged from this unsought publicity. The first was to quicken Lady Houston's interest in the matter. The second was to evoke an appeal and a protest against my participation from various supporters in my constituency and from the chairman of the Unionist Association.

I had originally approached Lady Houston as an acquaintance of my mother, and she had very kindly asked me to tea at Byron Cottage, her home in Hampstead. She listened to my brief statement and then turned away from it, without giving me any assurance, to resume her discussion of political matters which were clearly her main interest. She did not, however, attempt to pour cold water on the idea or decline to give it her support. I was immensely impressed with the intensity of her patriotism and the fervour of her feeling for Great Britain and the Empire. I felt that there was no sacrifice however great she would not be prepared to make in order to strengthen British prestige throughout the world or to set the British Empire more firmly on its foundations. Nevertheless, at this time she gave me no inkling of the idea, which may already have begun to germinate in her mind, that the flight intended as a serious contribution to the science of aviation and as a survey of remote regions, might be made to serve a political end by impressing a native population in India with the courage, endurance and vigour of the new generation of Britons. I had no thought of playing the heroic impersonator of British youth, nor had I looked on the expedition as likely to be particularly dangerous or spectacular. My assumption that an interesting task might be carried through without fuss or excitement was to be rather sharply shaken.

The Scottish Press pricked the committee's little bubble of complacent privacy and we found our project a matter of

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national interest. From that moment things began to move quickly. Lady Houston telegraphed me an invitation to go to Kinrara, her lovely place near the Cairngorms. Thereafter she took a maternal interest in my physical well-being. I am sure she was anxious that I should suffer no injury as a member of her expedition, and that the expedition should run no risk of failure through unfitness of its chief pilot. About the same time anxieties for my safety had arisen in another quarter and a letter from the chairman of the Unionist Association in the constituency contained the following paragraph:

I am being questioned from many quarters in regard to the newspaper announcement to the effect that your lordship may take part in the anticipated Mount Everest adventure. All who have spoken to me in connexion with the project are very much opposed to your lordship taking part in the affair. In fact, so serious is the objection that several influential people have stated that, if there is any truth in the report, I must call a meeting of the executive committee of your constituency in order to appoint a deputation to—I will not say remonstrate—but beseech you to withdraw from the expedition.

That demanded an explanation. It had been my intention to consult my constituency as soon as the completion of the financial arrangements made it certain that the expedition would take place.

The Press disclosures accelerated the pace of events in all directions. Lady Houston was in bed not very well, but I had to see her. It was then that she gave me her definite promise of support. She was extremely interested in the expedition on this occasion, and the prospect of raising British prestige in India through the expedition appealed to her enormously. She talked to me at length on the expedition. She said she did not wish to send me to my death and, therefore,

THE WAYS AND MEANS

wanted the whole undertaking to be properly organized. She suggested I should take the advice of two people—Mr. R. D. Blumenfeld, whom she afterwards nominated as her representative on the committee, and Wing Commander A. H. Orlebar, whose judgment in technical and flying matters she greatly respected.

During my stay at Kinrara I spent one bitterly cold day shooting and returned to the house chilled. Lady Houston became concerned and was subsequently most insistent that I should take pains to keep fit and be thoroughly tested as to my suitability for high-altitude flying. I did develop a cold later and, busy with the affairs of the expedition, gave less attention to it than it deserved. It so happened that I was suffering from influenza at a time when I had promised to address my constituents and to ask their approval of my share in the project. My explanation had therefore to be written from a sick-bed and was read to the meeting. It was necessary that the request be very definite, and I had to use forceful language to reach an end which might have been gained more easily by description and explanation had I been present in person to amplify any doubtful point which might arise. It was no good asking my constituents to grant me leave for three months to take part in an undertaking that was not worth while. My explanation therefore developed mainly into a screed on the merits of the expedition, which I regret made none too modest reading as it later appeared in the Press. In my anxiety to obtain the ready acquiescence of my constituents I laid special emphasis on the results to be gained from a successful expedition and on my fitness to take part in it. The meeting accepted it in the right spirit and passed a resolution giving me and the expedition their blessing. This statement received wide notice in the Press and evoked an unimportant but wild protest from one of the Congress

members of the Assembly in India against the brief reference I made to the probable psychological effect of the flight in India; and I began to feel that Lady Houston's belief in the political implications of the flight was sound and that these were likely to cause me some little inconvenience.

Later, in India, on my way through Delhi, I mentioned this matter to the Commander-in-Chief, who treated the intervention as one of complete unimportance and as only expressing an isolated view. Like Agag, we walked delicately after that. Permission to make the flight had already been obtained from India and from Nepal. Help had been promised by the Air Ministry and our committee maintained close touch during the period of preparation with the India Office and the Air Ministry. With Lady Houston's promise of support we were able to get on with the practical side of the work. Up to then it had seemed that we might have to live from hand to mouth. The day I came south after my successful interview with Lady Houston I found Blacker and Etherton in gloomy conference at the College of Aeronautical Engineering with the representatives of an air operating company. They had been driven by the financial difficulties to contemplate hiring an ordinary commercial aeroplane for the job, and the representatives of the company, recognizing the situation of these two gentlemen, were dictating terms which would have placed the vital part of the undertaking in their hands.

"We will provide the aeroplane and the pilot," they were saying as I arrived. "You can supply the photographer and equipment and we will fly him over the mountain. As to terms . . ." I sat patiently listening to the terms and took no part in the discussion while Blacker and Etherton showed more and more plainly the signs of depression and discouragement. When the visitors had gone, I told my good news.

Lady Houston had promised to contribute £10,000 and to guarantee a further £5,000. The whole situation changed. From the jubilation which succeeded the pessimism of a few minutes before, it might have been concluded that all practical difficulties were thus surmounted. Actually our new financial strength increased our responsibilities. We now had no excuse for improvisation or making shift. We had the means to obtain the best material for our purpose, and it rested on us to see that there were no errors in selection and no failure to foresee every possible emergency.

Quite the most suitable engine for our purpose was the Bristol Pegasus, which had just set up a new world's height record. Likewise, the aeroplane best suited to our needs seemed to be one of the general-purpose types which had given such fine service in the R.A.F. Blacker was in touch with the Air Ministry and the Bristol Company. He and I went to Yeovil to look at the Westland aircraft and to discuss the possibility of adapting them to our requirements. Negotiations concerning electrically heated flying suits, cameras and heated jackets to protect them, properly doped fuel and a host of smaller matters were opened. There seemed a thousand things to be arranged and tested and the attempt to divide labour and responsibility among the members of the expedition involved the risk that something might be overlooked. We were fortunate to have gained the interest and help of Lord Londonderry, Secretary of State for Air, and through him the assistance of Air Chief Marshal Sir John Salmond, at that time Chief of the Air Staff. The latter saw the risk we ran in seeking to divide among ourselves the labours of preparation for which we could count on barely three months. He advised the appointment of an experienced air officer to undertake the organization and himself suggested Air Commodore P. F. M. Fellowes, D.S.O.

No better choice could have been made. The Air Commodore was not only an able officer and a good organizer but an enthusiast in the cause of flying. He was twice decorated during the War, and the exploit which gained him a bar to his D.S.O. was one demanding the highest skill and courage. On May 28, 1918, when he was in command of No. 61 Wing, R.A.F., at Dunkirk, he flew over the lock gates at Zeebrugge and from a height of only 200 feet dropped a 234-lb. bomb right on to the gates. He was shortly afterwards wounded and taken prisoner. An enthusiastic pilot and a leader in the real sense, he knew how to bind together a body of diverse types, to take thought against possible causes of friction, and to provide against every misfortune which might befall the expedition. His appointment was of the greatest value to our preparations. He became entirely responsible for the executive side of the expedition, and he took great trouble to discharge his responsibilities. A thousand tasks were undertaken and carried through. He demanded such help as he needed from the rest of us and he satisfied himself that we had done what he wanted. Short though the time at our disposal was, there soon appeared every prospect that we should be ready according to schedule. Air Commodore Fellowes, accepting my suggestion, chose as the second pilot Flight Lieutenant D. F. McIntyre, an officer in my own squadron who had also had a period of service as flight commander in No. 12 (Bomber) Squadron. During November 1932 we were all assembled in London, and while we were helping with the general preparations we had to undergo medical tests.

In my case this was particularly necessary for the reassurance of Lady Houston. When she wrote to Mr. R. D. Blumenfeld about backing the flight, she mentioned the matter and he sent me a note in which he said: "She also wrote to me and stated that she was very anxious about your capacity to under-

take the flight from a health point of view and stated that she wanted to see Wing Commander Orlebar on that subject before anything further was done." Orlebar's opinion was greatly admired by Lady Houston, and he was also chief staff officer of No. 1 Air Defence Group. He was consequently responsible, under the Air Officer Commanding, for the Auxiliary Air Force to which both pilots belonged. I assured Lady Houston that I had passed the tests of the Central Medical Board at the Air Ministry and all the members of the expedition were now to be tested for high-altitude work in the pressure chamber at the Royal Aircraft Establishment at Farnborough.

I found this pressure test a most interesting experience. Our visit had an amusing side too. Blacker, who never appeared even on bathing parade without his monocle, wore it also when he entered the chamber. The diminishing pressure must have dislodged what nothing else seemed capable of disturbing. The monocle fell into the oxygen mask he wore in the chamber and the chief observer's efforts to replace it without losing too much oxygen in the process was a source of entertainment to his companions in the chamber as to colleagues waiting outside.

In that chamber the pressure was gradually reduced until it was equal to that of the atmosphere at a height of 39,000 ft. Each man had his oxygen mask similar to that worn in the air and could control the flow of oxygen to it. I had decided to experiment in the chamber with the object of discovering the symptoms of oxygen shortage so that I might recognize them if they occurred during the flight. I had heard that at a height of 30,000 ft. or above a man deprived of extra oxygen usually became unconscious in about 30 seconds. This I believed was due to the tendency to gasp and so to empty the system very quickly of oxygen. I removed my mask when the

pressure was that of 25,000 ft. and found there was a temptation to gasp but I hung on for nearly four minutes. Then I began to lose consciousness, rapidly replaced the mask and turned the flow of oxygen full on. On taking a few deep breaths my senses immediately returned. Again at 35,000 ft. I took off the mask, and this time I could hardly avoid the temptation to gasp. At the end of 35 seconds my sight was going wrong and I was on the verge of becoming unconscious. The sensation was rather that of taking gas without the unpleasantness. Putting on the mask I soon had my supply of oxygen flowing again and was surprised once more at the rapidity of my recovery. I took no more liberties at greater heights.

This little experiment increased my confidence considerably in the use of oxygen for two reasons. First, I had demonstrated to myself that there is a fairly definite warning of some seconds before one loses consciousness through lack of oxygen. Physical sensations alone would indicate oxygen failure while flying at altitude and even at 35,000 ft. there would be time to put the aeroplane into its gliding angle with the engine throttled right back and also turn the nose to whatever direction seemed best before losing consciousness. Secondly, I discovered that from a partially semi-conscious physical state due to the lack of oxygen at altitude, a few deep breaths from an oxygen mask in which a strong flow of oxygen was exuding, very quickly cleared the head and restored normal sensations. It was indeed good to know that if the main supply of oxygen had failed over the most unpleasant country the pilot would be warned by his sensations alone and have good time to turn on his emergency supply, and that this would immediately disperse any adverse physical effects he might have received. A practical example of this did occur when Penrose, the Westland test pilot, was flying the Wallace at something over

30,000 ft. over England. He suddenly received the sensations of lack of oxygen and at once throttled back and wound back the tail-actuating wheel so putting the aeroplane into a glide. He even then had time to inspect the oxygen fittings and detected the trouble which was due to his oxygen pipe from the mask not being securely fastened in the bayonet union fitted on the machine's dashboard.

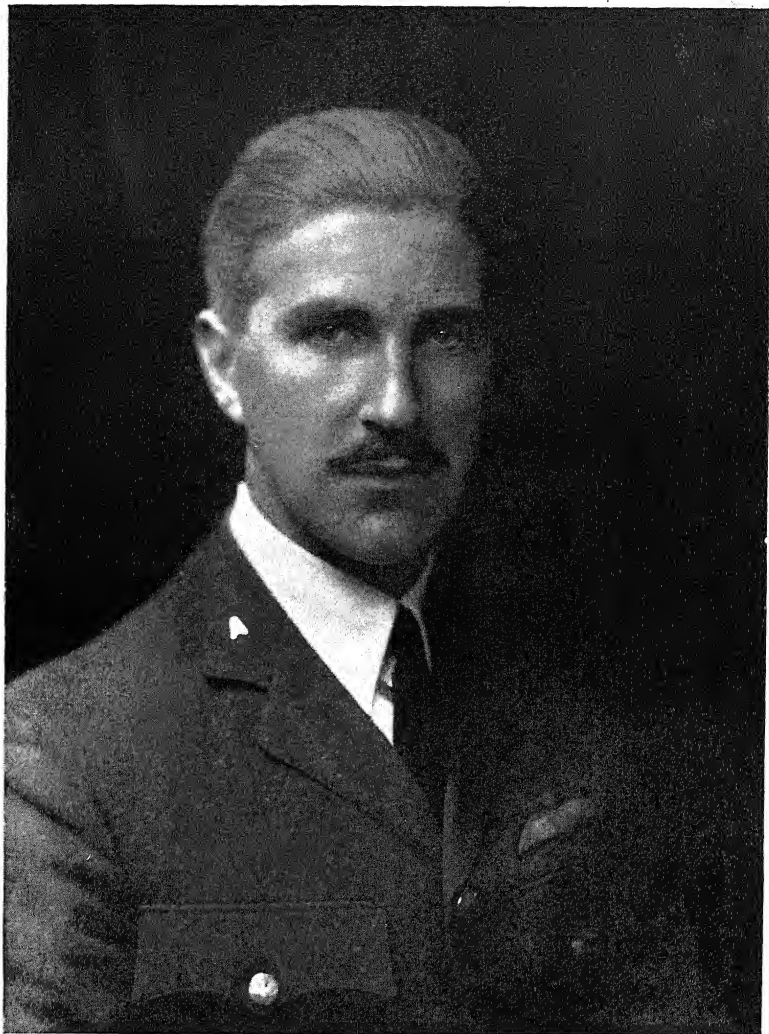
The experience of greatly diminished pressures is not very pleasant. There is a sense of distension; but none of the flying members of the party suffered any serious discomfort or revealed any physiological peculiarities under test. We were a very fit party and we took quite a lot of trouble to keep ourselves in training from the time when we knew we were to take part in the expedition.

Finally, in January 1933 we went down to Yeovil to make sure that the two Westland aeroplanes would reach the necessary height with the load we wanted to carry. The loaded weight of the aeroplane I was to fly—described originally as the P.V.3 and renamed the Houston-Westland—was well over two tons. We had a 580 h.p. engine provided with a supercharger, to carry that load to a height of at least 35,000 ft. The constructors estimated that it would climb 30,000 ft. in 28 minutes. We had to satisfy ourselves of that because we wanted to be able to spend as much time as we could get near the summit of Everest. But there was a host of other things to be tested. The fuel must be right and the oil and lubrication system must not give any trouble in low temperatures. The aeroplane must still be fully controllable in the thin air of 35,000 ft. The generator must give us all the current we needed and the resistance-regulator must work properly to save us from too much or too little heat. The oxygen apparatus must be proved. The cameras must be tried in the intense cold of high altitude. In the course of our

tests they presented a serious difficulty. Both the cinema and vertical film cameras became very temperamental in extreme cold. This difficulty had to be overcome as a result of tests in a refrigerating chamber.

Air Commodore Fellowes went up as passenger on the first flight with the Westland test pilot, Mr. H. J. Penrose. The weather was intensely cold, and at 35,000 ft. the temperature was minus 60 degrees C. or about 15 degrees below what we found over Everest. A few days later I made my first climb to high altitude in the Houston-Westland with Blacker in what M'Intyre christened "the office"—the spacious and well-arranged rear cockpit. We got all we expected from the machine and its equipment. The climb was made easily, and the efficiency of the supercharged engine was such that at heights above 30,000 ft. we had a top speed of 140 miles an hour. The oxygen and heating apparatus worked perfectly. I was not conscious of the low temperature in my open cockpit, nor did Blacker suffer any discomfort except when he opened the hinged roof of his cockpit and stood with head and shoulders above it to practise taking photographs. The Eagle survey camera continued to do its work in temperatures which sank to minus 41 degrees C. at the top of the climb, and we concluded that the heated jacket formed sufficient protection for it. We reached a corrected height of 30,000 ft. and could have easily climbed another 5,000 ft. At 29,000 ft. I could just recognize Andover Aerodrome looking more like a tennis court than an aerodrome. After climbing another 1,000 ft. I could not recognize any of the country below me, owing to haze. I then decided to descend so as not to run the risk of losing myself and having to make a forced landing away from Yeovil.

The other machine, which M'Intyre was to fly, was not ready until a week later. This was the Wallace, which has



Locke

FLIGHT LIEUTENANT D. F. M'INTYRE,
Second Pilot Houston-Mount Everest Expedition, 1933

since gone into regular service as a general-purpose aeroplane in the R.A.F. It was adapted in the same way with a cover for the rear cockpit and hinged windows to allow oblique photography. It was fitted with the supercharged Pegasus for high-altitude operation, and special precautions had been taken against the risk that the controls might become "sloppy" through the differential contraction of the steel and the duralumin of the structure in decreasing temperatures. On its first test flight there was slight trouble. The flexible driving shaft of one of the petrol pumps broke, but this was soon rectified, after we had all been made anxious by the machine's forced landing at Hamble, near Southampton. The constructors had little time to make any adjustments. The Wallace was actually passed for service only six days before it was due to be shipped in London for India. In that short space the wings and tail unit had to be taken off and the whole packed safely in two huge crates.

Meanwhile, we were collecting in London a mass of other equipment, ranging from office furniture to the rifles and camp gear which might be needed at a remote forward landing ground, and were arranging for its transport to our base. Plans had already been made with the India Office and the R.A.F. for the use of the existing landing ground at Lalbalu, nine miles east of Purnea in Bihar, but we were not sure that we should not be forced to seek an advanced base closer to the mountains, or what conditions we should find if we had to use it. The experience of others was not likely to help us much. We were to approach Everest on its most secluded side, and we were prepared to deal with whatever conditions we found. When I look back on those three months of intensive preparation, I find it difficult to account for the thoroughness with which they were made. As far as I can remember, only one section of the stores slipped through unchecked, and that

was a box of plates for the smallest hand cameras. When we came to use them in India we found they were the wrong size.

In the last stages the organization had swollen. There had been some additions to the original committee and another representative of Lady Houston had joined the party. Long before, Etherton had foreseen the need to cover some of the expenses by selling the film and newspaper rights in the expedition. I may confess that I disliked the idea of film and Press publicity, but it became evident that the work would be costly and that Lady Houston's guarantee would not meet the whole cost. We had therefore entered into agreements with the Gaumont British Picture Corporation and with *The Times* newspaper. We soon began to feel the pressure of our publicity obligations. The committee relieved us largely of the responsibility for newspaper articles prior to our departure from England and allotted certain writing duties to each member of the expedition when once it had left England. From the attentions of the camera men it could not save us. We began to feel that we should have to pay heavily for the privilege of a share in the expedition. We did not realize at the time that it would mean playing our parts, after the expedition was over, as film actors with the arc lights of the studios pouring their rays upon us.

We had not bargained for that, and I doubt whether any of my colleagues relished the idea of writing long articles about our doings for *The Times*. During the period of preparation we had met the aeronautical correspondent of that newspaper and he had impressed us with the degree of public interest which our project had aroused. Our original, modest idea of sending back brief and perhaps laconic accounts of our doings in the Himalayas soon appeared quite inadequate. He assured us that the Press not only of England but of the whole world would want to know how we fared. *The Times*,

he said, was arranging to distribute the story of the expedition in European, American, Australian, African, and Asiatic newspapers. We, who had thought that our main duty would be to make our reconnaissance and report our discoveries soberly and leisurely to learned societies and to the aircraft industry, were suddenly forced to acknowledge a much more arduous duty to the public of the civilized world. The prospect was a little staggering, and Shepherd, who was *The Times* special correspondent, seeing our dismay, put us down as a set of amateurs unfit to serve the world's Press, and advised his office accordingly. At all events, he was offered to us as official recorder, and no offer was more gratefully accepted.

Gradually our anxieties resolved themselves. The aeroplanes in their crates were loaded into a cargo ship at the London Docks for Karachi. This operation presented a serious difficulty at the last moment, which looked like holding us up. We had omitted to inquire the size of the hold of s.s. Dalgoma, the ship to take our aeroplanes to Karachi. The Westland Company had stated that on no account were the crates to be tilted more than 30 degrees. The most cursory glance made it quite evident that it would be impossible to place the crates in the hold without tilting them very considerably over 30 degrees. This produced a crisis, but by very careful handling on the part of Air Commodore Fellowes personally this difficulty was surmounted and the crates were gently tilted to approximately 60 degrees without the machines suffering any ill effects. Equipment and stores were despatched—some to Karachi, some right through to Purnea. Our smaller aeroplanes were assembled at Heston and most of our personal luggage was handed over to a shipping company. The film unit, consisting of the producer and seven men with a vast array of cameras, sound apparatus and the like, set off by boat, as did Etherton, our honorary secretary.

Blacker travelled to Karachi by Imperial Airways, and the small residue of the expedition cut down its hand luggage to the minimum so that the three small aeroplanes should not be overloaded. We had to set out for India with less luggage than we might normally take with us for a week-end visit.

I remember the reluctance with which the Air Commodore admitted the logical argument of Shepherd that, as he was 20 lb. lighter than either pilot, he could be allowed an extra 20 lb. of luggage. The Air Commodore was wisely determined that the aeroplanes should fly well within the proper loaded weights, and we were glad later not to be overloaded when we had to use sticky and small aerodromes.

Our preparations ended and we departed for our task with many signs of interest and goodwill. The King graciously sent, through Sir Clive Wigram, a kind message wishing the expedition success and assuring us that he would follow our movements closely. Lady Houston commended us by cable to the benevolent care of the Viceroy and received from Lord Willingdon in reply the assurance that he would speed us on our way. We had been in touch with the Royal Geographical Society, whose expedition to climb Mount Everest was already in India and had both made clear the specialized objects of our own project and had promised to offer such help as we might, by supplying photographs of the mountain, if we made our flights before the climbers reached the summit. The mass of work which had to be done made the task at closer quarters appear more formidable than it had seemed in prospect. In the moments of stress, one felt that only a miracle could save us from the omission of some vital piece of equipment or could secure us against the failure of one or more of the instruments or pieces of apparatus. We left England both heartened and impressed. If we had needed a steadying influence, the work of preparation had supplied it. From that time onwards we left as little as possible to chance.

CHAPTER III

THE FLIGHT EASTWARD

We have often told each other in reminiscent discussion that we were in more danger before we reached India than we were over the Himalayas. That may not be strictly true. Our risks on the flights over Everest could be fairly well defined, and we were at liberty to choose our time so that those we could not strictly define should be reduced to a minimum. On some parts of the journey from England to Karachi we were a little short of the information needed, and found ourselves in conditions we had not anticipated. In that sense it may be said that large risks had to be taken and we did consequently have adventures. Some of them were trying but most of them were amusing as well, and the tale of that journey will perhaps bear description.

We were a party of six in three small aeroplanes. The Air Commodore and Mrs. Fellowes had a Puss Moth, M'Intyre was flying Clydesdale's Gipsy III Moth, and Clydesdale had taken over the Fox Moth, bought by the expedition for reconnaissance and transport work. The passengers in the Fox Moth were Shepherd, *The Times* representative, and Hughes, ground engineer to Clydesdale. We decided to keep all three machines together for the whole journey. The Gipsy III Moth had the slowest cruising speed, amounting to about 90-95 miles an hour. It was therefore arranged that M'Intyre should lead and navigate, and everything was done to increase this machine's speed, which had of necessity to be our collective cruising speed. A metal Fairey-Reed airscrew had been fitted and we arranged that M'Intyre should carry no passengers so that the open front cockpit could be covered in order to give better

streamlining. The speed of this machine was thus increased by four miles an hour and we were able to count on cruising at 95 miles an hour.

A large crowd of friends and others had gathered to see us off at Heston on the bitterly cold morning of 16th February. Numerous delays occurred before we started, and we were subjected to an appalling ordeal by cinema and microphone. The Duchess of Hamilton had come to Heston accompanied by friends to speed the party. To the majority of the members this was by far the most trying time of the whole expedition. It was a relief when we were at last in the air, after a very long run by the heavily loaded Fox Moth, and all three machines were heading for Paris.

Shepherd and Hughes were somewhat to be pitied on this first stage. After the long and cold delay at Heston they eventually climbed into the cabin of the Fox Moth and then all the remaining luggage was bundled in on top of them, and a great deal of that which had already been loaded fell on them as soon as the machine began to move. During the whole $2\frac{3}{4}$ hours of the flight to Le Bourget they were not even able to turn on the cabin heater in the floor, although they made desperate efforts to reach it. They were consequently almost frozen when we reached Paris. Hughes had another reason for concern. He had been badly shaken by a chance remark of Mr. C. G. Grey. The Fox Moth, a comparatively recent production at that time, was an aeroplane in which the passengers occupied a cabin in front of and below the pilot. Mr. Grey, who had kindly come to wish us luck, had not up to that time examined this type of machine at close quarters. He greeted Clydesdale in a voice loud enough for Hughes to hear, with the jocular remark: "Well, so this is the new Fox Moth. I call it a rotten aeroplane; at least, rotten for the unfortunate passengers when the pilot loses consciousness.

Think of the awful sensations sitting in that cabin as the machine begins spinning to earth. It would be quite impossible to do anything. In a Puss Moth the passengers at least can try to take over the controls, but in this aeroplane they could only sit still and wait for the crash." Mr. Grey, of course, meant no disparagement.

Hughes, who was already looking blue from the cold, assumed a most miserable expression which could only be attributed to apprehension. It afterwards transpired that Shepherd and Hughes had spent a large part of that uncomfortable journey between London and Paris discussing measures to be taken in the event of an emergency such as Mr. Grey had imagined—measures which depended in the first instance on the ability of these gentlemen to free themselves from the masses of luggage under which they were submerged. The flight to Paris certainly was cold, for we crossed the Channel at a height of 7,000 ft. where the temperature was distinctly low. On arrival at Le Bourget an excellent lunch restored warmth to us all and particularly to the three chief sufferers, Shepherd, Hughes and M'Intyre, the latter being the only person travelling in an open machine. Moreover, Hughes during our halt in Paris, succeeded in repacking the luggage in the Fox Moth so that he and Shepherd were less restricted in their movements and travelled thereafter in greater comfort. We had now to follow the long route to India prescribed for winter use by the insurance people. There was good reason later for doubting whether the route through Central Europe could have been more difficult than the one we had to take through Italy and across the Mediterranean to Tunis.

At the start we seemed to be doing well. There were snow clouds over Northern France and a powdering of fine snow showed in the fields. But south of Paris sunshine was found and Lyons was easily made before the early darkness. The

following day we were away early, in the hope that we might be well on our way through Italy before night. Stages had to be carefully planned. Our range was only $4\frac{1}{2}$ hours, and the cruising speed of the flight only 95 miles an hour. Arrived at Marseilles, we began to inquire about Italian aerodromes. Pisa was reported unserviceable. Florence was said to be unfit. Rome could not be made non-stop. After receiving several conflicting reports, we gathered that it might be possible to land at the military aerodrome of Sarzana.

On we went across the mountains to Nice, along the Riviera coast into Italy and high over the coast hills, many of which looked like Scottish moors, to Sarzana, a little town some 20 miles from Pisa. Our intention had been to fill up quickly with petrol and get on to Rome for the night. Eventually the Air Force people supplied us with petrol from their own store and debited the quantity to the Shell Company, whose *carnets* we carried. These negotiations took time and our plan to sleep in Rome had to be abandoned. Instead, we sought shelter in the local inn, whose proprietor was aghast at the prospect of finding beds at short notice for six extra people. The situation was not eased by our lack of Italian. Among us we had some French and German, but these were useless in Sarzana. It was not until one of the inn's regular residents returned that much headway could be made. He was a Czech who could translate our German into Italian and the proprietor's Italian into German for our benefit.

The result was that we got three beds between us but possession could not be taken of them until the day-time occupants had gone off to their night labours. The arrangement was not too good and some members of the party reported unwelcome parasites the following day, but by then we had found more comfortable quarters and the chance to clean up properly. Our next halt was Naples and here trouble

of another kind was encountered. Before landing we had a good look at Vesuvius and Pompeii. We flew quite close to the crater, passing through the column of sulphurous smoke so that we might look right down on the cone from which it emerged; and those who had cameras naturally made use of them. As soon as the aerodrome was regained, we were questioned about cameras and had to confess, to the horror of the officials, that photographs of Vesuvius had been taken. If only we had climbed up the volcano to get them, there would have been no trouble, but photography from the air was even in 1933 absolutely forbidden in Italy.

Our cameras were taken away, the films were confiscated and later the cameras were returned, sealed against further use over Italian soil. We spent the night in Naples and went on southwards the following morning in some uncertainty as to whether any of the aerodromes on our way were fit for use after the heavy rains. Fortunately, there was no occasion to come down before we reached Catania in Sicily and there we landed easily enough on a very wet and slightly boggy aerodrome. An officer of the Royal Italian Air Force met us and requested us to accompany him to the mess as the Commandant wished to see us as soon as possible. When we arrived we found the Commandant had with him the chief of the local police and he informed us that in consequence of our having flown over prohibited areas near the Straits of Messina the police could not permit us to go on. We had counted on reaching Tunis that afternoon; police interrogations and investigations lasted until the late evening, when at last they gave us unconditional freedom. The Italian officers were most sympathetic and sought to relieve our anxiety by the offer of drinks, which were much appreciated. It was four days before the weather was good enough to cross the island and get on our way.

Whatever had happened to account for the police activity at Catania was quite accidental. Our maps showed clearly enough the areas near the toe of Italy which must be avoided. One covered a piece of the toe, where presumably there are fortifications, and the other lay over Messina where, we understood, there was a munitions factory. Between the two a clear, though narrow, passage appeared to be open through the centre of the straits. This passage was taken by the Air Commodore and Clydesdale. M'Intyre, persuaded that the whole district ought to be given a wide berth, swerved inland behind the toe, came out on the far side, and made a 40-miles sea crossing to the Sicilian coast. Clydesdale laid a course down the straits, climbing the while to 10,000 ft., with the intention of looking into the crater of Etna on the way to Catania. He passed quite close to the snow-covered sides, but the summit was covered in clouds and his passengers were denied the close view they had hoped to get. Soon afterwards we landed to find that two of the machines had been reported over the prohibited areas. The Air Force officers received us most courteously and hospitably, but the police regarded our offence as serious and could not release us without authority from above. As a favour they allowed us to go to a hotel, provided promises were given not to leave without permission. That permission arrived at about 8 p.m., whereupon M'Intyre and Shepherd went to the local cinema and were gratified at getting two of the best seats in the house at the equivalent of a shilling each.

The delay at Catania was to be a very long one. The next morning we were up early and were sitting in the aeroplanes ready to start at 7 o'clock. At that hour the aerodrome officials were not on duty, and it was found impossible to obtain our papers. When we did receive them an hour and a half later the weather looked unpromising,

but we took off, only to be driven back by fierce storms over the hills. On landing we were charged an extra landing fee, though our absence had been only 20 minutes, and this led the Air Commodore to enter a spirited protest, with the result that we were not charged for our next landing when the weather again drove us back from the hills. We had to climb to 3,000 or 4,000 ft. to clear the hills, and as only the Moth had a turn and bank indicator, it was deemed unwise to risk flying blind in heavy thunderstorms.

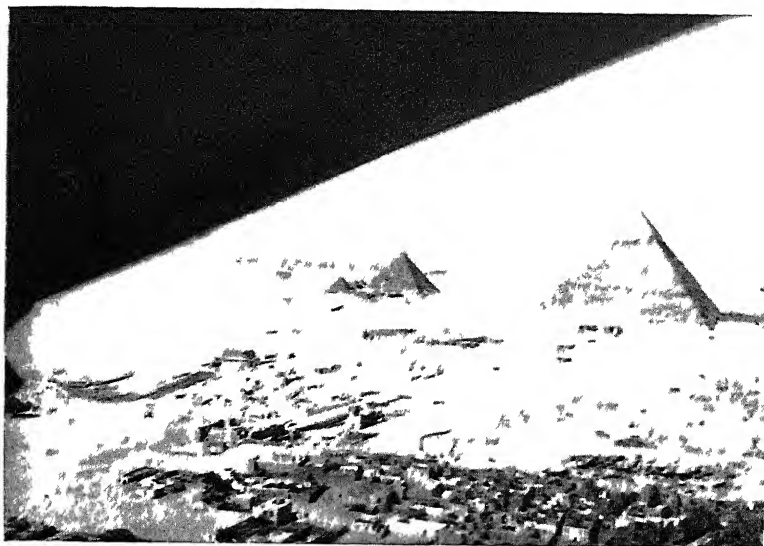
During the next three days the weather was bad. Thunderstorms marched across the mountains at regular half-hourly intervals. It was impossible to go round the coast without exhausting our petrol for the Mediterranean crossing; we could not go across country because storms lay on the hills; according to local information we might not land at Trapani, first, because it was flooded, and, secondly, because it was a military landing ground. At last we asked special permission from Rome to land there and, having received it, set out to follow the coast. That was a very trying journey. The storms in the hills forced us down into the valleys and we had the curious experience of flying through a heavy storm with the precipitous walls of a deep valley on either side of us. Trapani was reached in a gale and rain. M'Intyre landed first and, turning to taxi into the hangar, nearly got blown over. Clydesdale's two passengers hopped out to man-handle his wing tips.

Meanwhile one of the wheels of the Fox Moth had begun to sink into a soft patch and the handling party dashed back over the sodden aerodrome to put shoulders under a wing while Clydesdale opened up his engine to lift the wheel out of its bog. Presently we were safely assembled, very wet, cold and miserable, in the large hangar. While the machines were being filled up, suitcases were opened and dry clothing

was put on. There also we had the amusing experience of watching the Air Commodore manage an attendant who had not the slightest idea what to do about us or our machines or the documents that went with them. Judging by his expression, we doubted if he had ever seen a *carnet des passages* in his life and his stolid face showed no understanding for all the voluble explanations offered in English and French by the Air Commodore. The man just shrugged his shoulders and eventually the Air Commodore himself took the documents and the rubber stamp and showed the man where the one should be put on the other, reinforcing every act with the loud ejaculation: "*Très bon!*"

Two or three hours later we made our cheerless way into the town of Trapani and took quarters in what seemed to be the only hotel—a place apparently without heating apparatus of any description. The bar was full of seamen and dockside workers. The only other public room was the dining-room. Thoroughly chilled, we stared out of its windows across the harbour where the gale, howling dismally, whipped the tops of muddy waves into white caps. Once again it was awkward to be without Italian, for the solitary waiter had ample ideas on the subject of food but was quite unimaginative concerning the forms of liquid warmth needed by cold men while they waited for his enormous dish of fried eggs.

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M'Intyre, who might grumble about the cold but never allowed it to get him down, tackled this matter with the energy and ingenuity which made him so successful a member of the party. Having decided it imperative to get the chill out of our bones, he took the waiter in hand. Rum, he felt, was the only specific, and rum mixed with those things which turn the heavy spirit into the heartening concoction known as rum punch. The spoken word failed him. The



Before landing at Almaza Airport, Cairo, our machines flew past the Pyramids and the Sphinx which can be seen in the foreground



MINTYRE BARWELL CLYDESDALE MARTYN

At Baghdad the pilots were greeted by two old officers of No 602 Squadron, Sq/Ldr Martyn and F/Lt Barwell

written word was more nearly successful, probably because it was given in a graphic form. M'Intyre wasn't content to make a list in three languages of the constituents; he drew a picture of a punchbowl and indicated the items in layers within, adding in excellent pantomime the idea of stirring the brew. The waiter produced sugar, lemon, hot water, but no rum. Whisky he knew all about, but rum seemed not to have any easily recognized equivalent in Italian. The rest of us would have taken the whisky gratefully, but, to M'Intyre, rum was the only proper treatment. He looked over the bottles on the shelves and found none. Then his eye ran over the seafarers in the bar and the thought occurred that sailors and rum must be complementary the world over and that sailors, hornpipes and rum might bear some relation to each other even in the Mediterranean.

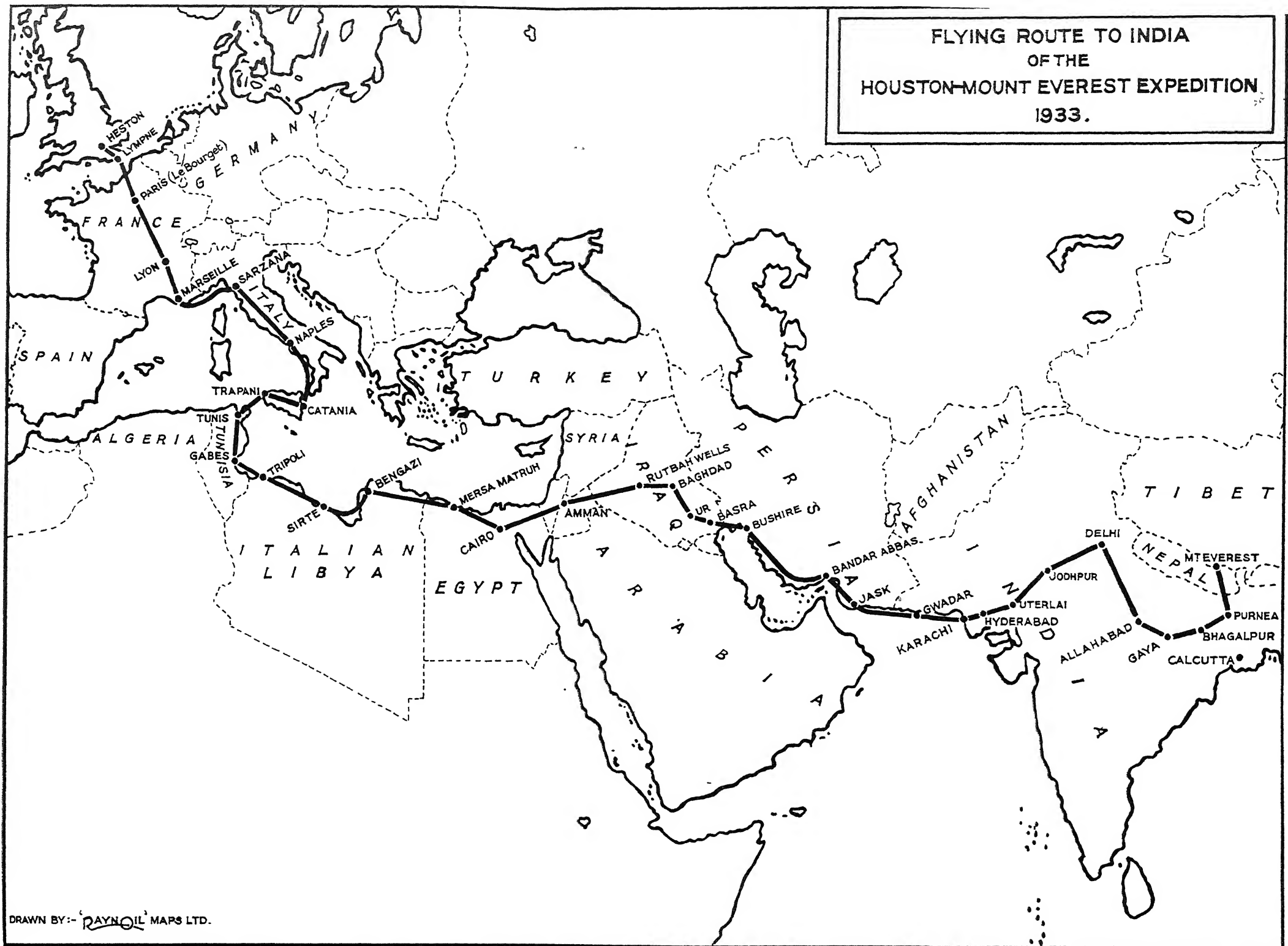
Commanding the waiter's attention in a good Scottish accent, he began to perform a hornpipe to the vast entertainment of the company and to the obvious enlightenment of the waiter. A rum bottle was brought. There was very little in it, and it sufficed only for one issue of rum punch to the younger pilots and their passengers. Our leader in his Puss Moth had not got wet and in any case was away in the bedrooms superintending the making up of beds which had evidently not been used since the summer. So we drank M'Intyre's health and helped to restore our own, and when we had eaten an enormous meal, consisting chiefly of eggs and that curious bread sprinkled with aniseeds, sought our beds. Some members of the party persuaded the maid to discover hot-water bottles, and we all came to breakfast next day feeling that even if we had to come down in the Mediterranean we should be able to put up with the wet and cold for quite a long time. We were naturally anxious to keep ourselves fit, because it would have been foolish to

tackle a high-altitude flight if the breathing apparatus of any one of us was impaired by a cold or cough.

We were at the aerodrome by 7.30 that morning, but the storm continued with heavy clouds and rain and a headwind of fully 40 miles an hour. We waited and waited, relieving the tedium by eating some of the hard-boiled eggs and aniseed bread brought from the hotel. Clydesdale collected weather reports and took the advice of those who were wise in the ways of local weather, and it was all very unpromising. We waited six hours for a break and, when it came, went off in the teeth of the wind to make the 150-miles crossing to Tunis. It took us two and a half hours to make that trip—a ground speed of 60 miles an hour—and for 30 miles we skirted the side of a huge storm cloud. On the whole journey only two ships were seen. If an engine had failed and we had alighted in the sea, it would have been a long time before a rescue could have been effected.

Fortunately, there was no such trouble, and as we neared the African coast the weather improved. We actually sighted land at 40-miles range, and this time were very careful to avoid prohibited areas. On landing we were perturbed to find two officers from the French Air Force headquarters awaiting us. With memories of our reception at Catania in our minds, we concluded that after all we must have trespassed again over prohibited areas and were going to have to repeat all the explanations and apologies that had belonged to our Sicilian adventure. This impression was heightened when the local Shell representative was found to be waiting with two motor-cars and assistants who were prepared to relieve us of all Customs responsibilities. He presented us to the two officers from the headquarters of the 4^{me} Group d'Aviation d'Afrique. They informed us that their commanding officer desired to see us at once in their mess and,

FLYING ROUTE TO INDIA
OF THE
HOUSTON-MOUNT EVEREST EXPEDITION
1933.



assuming this to be as much a command as an invitation, we left all our goods and chattels and drove round to the other side of the aerodrome to find that, instead of being arrested, we were to be entertained and shown the warm, if formal, hospitality which the French can do so well. Set out on long tables in the mess were all those things which appertain to *champagne d'honneur*.

In Tunis the whole complexion of life seemed to have changed for us. A warm sun was shining and people were glad to see us both on the aerodrome and in the Air Force mess. Conditions were in strong contrast to those we had left behind in Trapani. Colour and warmth had come back into our existence in the brief space of three hours. On our way into the town we passed a flock of flamingos. In the distance could be just seen the site of ancient Carthage. Before us was a very good hotel and it was difficult to realize that we had just left winter and Europe behind and were on the edge of African deserts. The tackling of those deserts was commenced the next day, and in the course of two days of desert flying we were to be impressed with the friendliness of French and Italian officers on colonial duty.

We could probably have made the journey to Tripoli non-stop, but were meeting a headwind and were quite new to navigation over the featureless desert, so when we made the French outpost of Gabés without difficulty, it seemed wiser to go down and fill up. Our petrol had to be brought from the town in a horse gharry and, while waiting, the officer commanding the station showed us over the hangars. By lunch-time we were in Tripoli where the Italians were equally charming, and by dusk we had covered another 300 miles to the Italian station at El Sirte, having had to keep the windows of the cabin machines open all the afternoon on account of the heat. Nothing was known of the village of

El Sirte. We still know nothing of it, for we reached the aerodrome at dusk and left it again at dawn. It had innocently been assumed that beds would be procurable there, but the Italian officers solemnly assured us that the local rest-house, used chiefly by natives, was out of the question and insisted on giving us dinner and quarters in the station.

That night we slept comfortably in cell-like bedrooms and at five the next morning the guard roused us by candle-light with cups of hot, black coffee. We shaved, dressed and packed before it was light. On turning out on to the landing ground there was still only the faintest hint of daylight in the sky, yet our aeroplanes had been wheeled out and our officer hosts were waiting to wish us good-bye. Our next halt was to be Benghazi, a full three hours away, and, in the chill of dawn, thoughts turned a little anxiously to the question of breakfast. The situation was met temporarily by the forethought of Mrs. Fellowes. She had saved some of the unappetizing rations supplied to us at Trapani, and now was able to give each member of the party one hard-boiled egg and one lump of hard aniseed bread. We munched our iron rations gratefully as we laid course for Benghazi. If that had been all, we should have had a thin day, because all the daylight hours obtainable were necessary to make Egypt that night, and there were no restaurants on the landing grounds used. A chance remark of M'Intyre's secured us a sumptuous breakfast at Benghazi and that was made to serve for luncheon as well.

We landed there in a high wind. Dust was driving in clouds across the desert aerodrome, but there was plenty of help and a cheery welcome from the officers of the station. M'Intyre was overheard by one of them, chaffing Shepherd about his breakfast in the air, and the result was a visit to the mess and a fine spread of fried eggs, toast, fruit, wine

and coffee. The officers reassured us, too, about the 40-miles-an-hour south wind which was howling about the place. It was never met at heights above 3,000 ft., they said, and we all decided cheerfully enough to fly high. All that is, except M'Intyre, who had already been gently reproved by the Air Commodore for flying the open Moth across the desert at a height of about 1,000 ft. The truth was that temperatures in North Africa were rather low at 3,000 ft. and M'Intyre preferred to take the risk of a hasty forced landing rather than to be chilled for seven or eight hours a day in his open cockpit. By way of excuse he had professed an interest in the caravans we passed and had disarmed the Air Commodore by protesting that he liked to see the expressions on the camels' faces.

He made light in much the same way of the really fine navigation he did for us on the journey across North Africa. Shepherd cross-examined him at Tobruk about the accuracy of his navigation from Benghazi in view of the fact that the wind had changed practically from our starboard beam to our port beam in the course of the trip. As he was flying the slowest machine of the three we had to let him lead on most of our stages, and in this case, when we took a compass course across desert land where there was neither smoke nor long grass to show the way of the wind, he brought us out on the coast exactly at the point we sought, though we were using only very small-scale maps. Shepherd wanted to know how he had discovered the change in the wind, and M'Intyre, with a mischievous glance at the Air Commodore, replied that, flying so low, he had been able to notice which way the "Arab gents' summer suitings were streaming out in the wind" as they sat their camels. It was at Tobruk that we had the quickest refuelling service. We wanted to reach Mersa Matruh that night and appealed to the officers to

save what time they could. Most of the station turned out to give a hand and we were in the air again 45 minutes after landing. The Italian commanding officer very kindly had refreshments taken out to us right on the aerodrome. The halt would have been still shorter but for a mild argument concerning the scale of the landing fees.

Now the Egyptian frontier was very soon crossed, but we had what seemed a long run to Mersa Matruh in the failing light. We hesitated over El Sollum, wondering if it would be wiser to spend the night there, but finally decided to take the risk and push on. In the event we made Mersa Matruh just five minutes before dark and for 20 minutes before landing had watched the black band of night advancing across the desert from the East. It was an uncomfortable sensation, sitting up there at 3,000 ft. and trying to calculate whether the darkness or the aeroplane would be the first to reach the landing ground about midway between them.

It was just as well that we won. The small unlighted aerodrome could never have been found in the dark, and, with its bad surface and the rough country round it, something would probably have been broken in landing. Arrived here, we had once more the comfort of a good hotel, and the only person dissatisfied was Shepherd. Every night in the desert he had been able to send a cable to London; now he was cut off completely. The telegraphs had closed down at 6 p.m. and the telephones had gone out of action for the night too. He could not even telephone to a colleague in Cairo. But for the knowledge that we should be in Cairo the following morning he would probably have chartered a camel to get back again on to a line of communications.

The following day's journey to Cairo was a short one, and although there was no need to start early, we were at the

aerodrome by 8 a.m., to find we were not the first. A Puss Moth stood there, taking in fuel and oil, and a bronzed Englishman was making pointed and forcible remarks to a native who had carelessly allowed oil to spill over parts of the engine where it could do nothing but harm. The indignant pilot was T. Campbell Black, who has since won fame in the Melbourne air race. He was making his fourteenth journey home by air from Nairobi, and had just landed from Alexandria, where he had spent the night. The long route we had modestly followed was not for him. He was going to strike out over the Mediterranean and Crete for Athens and thence to take the straightest way to Paris and London. We saw him off and then began our own little trip to the Pyramids, of which we had a magnificent view, and so to Almaza and the two days' rest allowed us by the plan to have the usual 25-hours inspection of the engines carried out.

Our stay in Cairo was made most enjoyable by the R.A.F., whose officers were determined that nothing should be missed of the sights or the social delights. When our journey on the second morning was resumed, the country was smothered in a dust storm which was just beginning to blow up, and little was seen of the ground until we reached Palestine. There visibility improved and a stiff tail-wind took us along past the Dead Sea, Jerusalem and Jericho to the Jordan and on to our calling place in Transjordan. At last at Amman we were back at a British station and delighted at the chance of spending an evening again with British officers; yet the illusion of home-like conditions was not to persist. The report came during the evening of the escape of 18 desperadoes from the prison in the wadi below the R.A.F. station. In the late afternoon we had looked down on the prison yard while the prisoners were assembled there; two hours later we learned

that guards had been overcome, arms stolen and a party consisting mostly of murderers was away among the hills.

The incident made the ladies of the station a little anxious, and evoked, in justification of that anxiety, the story from our hostess, Mrs. Vaughan Fowler, of how she and a male escort had been held up by bandits on their way back from Jerusalem, robbed of everything valuable, and only allowed to resume their journey after half an hour's wrangle concerning the advisability of shooting her male companion. It was indeed alleged (with what truth we did not stay long enough to discover) that when the first report of this incident was brought to Group Captain Fowler, the one military authority in the district, he took it to be a joke and did nothing about the matter until the messenger insisted that he was speaking the truth.

As several of us were to sleep that night in the Group Captain's house on the very edge of the station, it was relieving to learn that 12 of the runaways had been recaptured during the evening. Clydesdale and M'Intyre had a game of squash before dinner that night and somehow contrived to lock themselves in the squash court and were unable to get out until Flight Lieutenant R. Ll. R. Atcherley went, fortunately, to their rescue. The rest of the night at Amman passed without incident. The meteorological officer advised an early start next day and we were up before dawn. There were already signs of the dust which had been pursuing us from Egypt, and none liked the prospect of the desert in such conditions.

About 500 miles of desert had to be covered before Baghdad could be reached, and in that desert the features repeat themselves with such monotony that they are useless as landmarks. The R.A.F. just after the War made a plough furrow to guide them on this run. Nowadays there is an oil pipe

line to follow and a motor-car track alongside it. The Air Commodore had taken a hand in making the furrow and knew enough about the desert to avoid foolish risks. As the visibility grew poorer we clung closer to the pipe line. At times we were only 100 ft. above it. The sand became thicker and eventually we lost sight of each other. We did not meet again until we reached the isolated fort at Rutbah Wells, the half-way house on several desert routes. Clydesdale got there first. The other two missed the point at which they should have turned away from the pipe line and had to go back in their tracks to look for it.

The Fox Moth, helped by the following wind, made Rutbah at 9.40 that morning. M'Intyre arrived 10 minutes later and took off again almost at once to look for the Air Commodore. He did not find him, but the Air Commodore soon realized that he had overshot the mark and came in half an hour late. The rest of that day was a trial to us. Weather reports were most unfavourable. Visibility was reported as five yards at some points between us and Baghdad; and the wind was whipping up white dust from the stony aerodrome to add to the fine sand already held in suspension. At last we settled in at the rest-house, picketed our aeroplanes and waited for an improvement. Life seemed likely to be pretty dull and tedious, particularly as the price of beer—the only available solvent of dust in parched throats—was about 3s. a bottle.

In fact the day at Rutbah turned out to be full of interest. Motor-car loads of pilgrims on their way to Mecca drove in to the fort during the afternoon and the occupants tumbled out with prayer rugs for their evening devotions and with pots and pans for the preparation of the evening meal. A party of police also arrived in three cars with machine-guns, bringing in prisoners charged with the theft of 400 sheep

from some tribe 100 miles away in the desert. In the evening a huge Nairn motor-coach, which operates on a regular schedule across the desert between Baghdad and the coast, put in for an hour or two with its begrimed and weary passengers looking anything but fit for the night's journey over bumpy desert tracks. For our part, we lived comfortably and well in the rest-house, our appetites sharpened by the knowledge that everything eaten and drunk had been brought at least 250 miles for the benefit of such as we.

The morning was cold when we rose soon after five next day, but there was much less wind and dust. The pipe line was rediscovered and followed hopefully towards the sunrise and Baghdad. We passed over a herd of camels feeding, as those frugal beasts will, on the coarse grass and scrub. A few coveys of what looked like sand grouse were put up. There was little other sign of life, but as the light improved, so did the visibility and soon we could distinguish the car track as it took its winding way to the horizon. Presently an occasional car bumped its way along the track beneath us, leaving a cloud of dust. In two hours the Euphrates was sighted. We had a good view of Ramadi and were in Baghdad soon after breakfast-time. Our plan was to go on to Basra and Persia next day, but neither the Ambassador nor Iraqi officials could discover the permits we had asked the Persian Government to grant, and our enforced delay there, made pleasant by British and Iraqi courtesy, gave us a chance to become acquainted with modern Baghdad.

Clydesdale was given an audience by King Feisal, and, knowing already of the value he put on air power for the maintenance of order in his own territories, was gratified to find how interested he was in flying generally. Moreover, his brother, H.R.H. The Emir Deid, had been a friend of Clydesdale's at Balliol and had often spoken to him of King

Feisal. Feisal wanted to know from Clydesdale all about our plans for surmounting Everest and he put a number of questions about the oxygen apparatus. He was already in process of raising an Iraqi Air Force and contemplating the employment of aeroplanes to improve the communications of his desert land. Clydesdale's experience as an owner-pilot and as an officer in a Territorial air unit interested him, possibly because it showed that some measure of efficiency could be obtained in military aviation in a comparatively short space of time. The force which he began soon afterwards to recruit began their training wisely in aircraft not much different from those used by the British private-owner, and are now, after his death, progressing towards those types which the British Auxiliary Air Force employs.

Fortunately, we did not expect too much of Baghdad, yet the romantic associations which adhere to the very name made us a little unprepared for the rather drab place of commerce we found it to be. The river still keeps something of its ancient character. The round boats of its earlier days are to be seen on its muddy waters. The one and only bridge—General Maude's bridge of boats—seems to belong to the age of legend and spaciousness. It slows down the rate of business progress and compels administrations to keep motor-boats as well as motor-cars for the traffic between either bank. But the town of Baghdad is a little disappointing in the matter of architecture and definitely startling in the matter of atmosphere. Some of our most vivid memories of Baghdad consist of odours. Several of us had ventured hopefully on a sight-seeing tour of the Iraqi portions of the town. Our visit must have coincided with the hour of preparing the evening meal. Attention, which might have been concentrated on buildings, shops and people, was claimed by the pervasive odour of garlic and heavy oil, and we found a mild

relief on making our way back to the Embassy and the more familiar atmosphere of the British household maintained there by Sir Francis and Lady Humphrys.

Never in Baghdad was it possible quite to escape the smell of oil, the staple fuel in an almost tree-less land where oil is the chief source of wealth. Our chief discomfort, nevertheless, was of the mental kind. We wanted now to get on to Karachi so that we might superintend the assembly of the big aeroplanes for the flight over Everest. The day spent waiting for our Persian permits was one of perfect flying weather and we had seen how fickle the weather in Iraq could be. Our anxiety was justified. When next day, our permits arrived, a wind had sprung up to raise the dust and make us hesitate.

Again it was a dust storm which upset our plans. The outliers of that storm had accompanied our take-off from Baghdad, but the weather experts reported Basra clear and we headed southwards into the thickening haze. We took the advice of the R.A.F. officers and hugged the railway line. The advice was better than we knew, for in two hours the air was so thick and the light so poor that the line could barely be seen from a height of 100 ft. For another half-hour we groped our way on and the weather became even worse. We decided to give it up and turned to make forced landings on a piece of flat land beside the railway. Clydesdale watched M'Intyre while he made a difficult landing, and, concerned for his passengers, was relieved to see him on the ground right side up. Then Clydesdale followed him down with his flying hospital (for Hughes had been a sick man at Baghdad), and we found ourselves alongside the tiny station of Batha.

The station-master spoke English well and advised us to creep along another 20 miles to the landing ground and rest-

house at Ur. M'Intyre offered to try out the conditions and to telegraph advice to us from Ur. The station-master offered us shelter from the biting, sand-laden wind, in his office, and while we waited a brazier was brought in and tea was made for us. Our telegrams to Hinaidi and Shaibah announcing our forced landings were tapped out while tea was sipped in the midst of a most friendly group. In half an hour the message from M'Intyre arrived and we flew carefully along the line, having been coached precisely by the station-master as to the location of the landing ground. We found it without trouble and there in the middle of the landing circle stood M'Intyre tearing up letters and hotel bills into small pieces and scattering them to show us the way of the wind. A crowd of small boys had already gathered from the adjacent native village, and the local policeman had to be discovered before we thought it safe to leave the aeroplanes and seek shelter for the night at the railway station. Visibility was still less than 500 yards.

When the craft had been picketed down and left under guard, we started on our walk through the shabby village, with its dogs snarling at our heels in the dusk, to the railway rest-house. It appeared to have only three bedrooms, and one of these had been reserved by telegram for a Herr Doktor who was coming to visit Mr. Leonard Woolley and his excavations. Nothing was seen of either. We had an evening meal, mostly out of tins, and then visited the railway institute and drank a little light beer (Japanese, it appeared to be) with the local worthies, some of whom were playing billiards on a perfectly good English table. Then we divided ourselves among the two bedrooms and had a good night's rest. Before the evening was out a message came from the Air Commodore to say that he had got through to Shaibah and was thoughtfully sending us some petrol on the

night train. Actually there was no need of it, and early next morning we took off before it had arrived. We had the satisfaction of arriving at Shaibah before the Air Commodore was out of bed, and the chance to chaff our leader about keeping the expedition waiting fully restored our spirits.

Soon after 9 o'clock our journey was recommenced over the interminable mud flats near the mouth of the Tigris, past Abadan with its dozens of oil tanks, refining plant and the huge flame which marks the burning of the waste gases. Presently we were over Persian territory and the nature of the land was improving. Just before noon we made the town of Bushire and were pleasantly surprised to find a grass aerodrome and signs of trees and flowers. After days of desert flying the sight was most refreshing, but after the trouble we had had in getting our Persian permits and the muddle which had been made in drawing them up, we were not too certain that the mood of contentment would survive our reception. For the last two days we had been assuring M'Intyre that he would have to be left in a Persian prison. All three aeroplanes were clearly identified on the permits and all the occupants but M'Intyre were mentioned. Until Bushire was passed, M'Intyre himself declined to take any interest in the rest of the flight, though he promised cheerily to follow us to Karachi by boat.

The difficulties anticipated did not arise, largely, we believed, because of finding ourselves in the capable hands of Captain Gastrell, the Assistant Resident at Bushire. It is only fair to add that our relations with all Persian officials but one were most friendly and often cordial. Shepherd, for instance, who must have been quite a trial to the local telegraph office with his cable written in plain English and his arrangement for *The Times* to pay for it on delivery instead of handing over good Persian silver on the spot, was enter-

tained by the superintendent with a tray of tea and had to accept a big packet of Persian cigarettes from him on leaving. All of us except Mrs. Fellowes also paid a call on the governor of the province and found him a charming, intelligent man, who spoke good English and better French and seemed quite pleased to talk with us and offer us refreshment. He gave us tea on our arrival and when we had talked and smoked his excellent Persian cigarettes he called for coffee to speed us on our way. We were rather surprised at the conditions apparent at Bushire. Clydesdale's father, the Duke of Hamilton, who was stationed for some time as a naval officer in the Persian Gulf, had told him stories of the appalling damp heat to be found there and had given him the impression that it was one of the hottest places in the world. When we landed at Bushire, the weather was very cold and it remained cold, so that the following morning it was found necessary actually to take off in great-coats.

Provincial officialdom was to be met in its less favourable form at Bandar Abbas next day. We were off early enough from Bushire to see the sun climb up red and gold from behind the clouds on the mountain tops, and almost immediately after taking off, were skirting the bases of those mountains which come right down to the sea's edge, often in the form of huge, jagged teeth, leaving nothing for the emergencies of the aeroplane but a strip of steep beach. Daunting as this country was from the pilot's point of view, its beauty and impressiveness could not be ignored. Many of these rocks have perpendicular sides; some are huge gable-ends leaning back at an angle of 45 degrees; some are reproductions in miniature of mountain ranges with saw-edged ridges, peaks and small valleys. And although there is little vegetation, the landscape has plenty of colour, for the rocks are done in browns and greys and a sort of pale ochre.

With a useful tail wind, we slipped comfortably along this coast to Bandar Abbas and only realized how hot the day had grown when landing there. Up to this point the pilots in the cabin machines had not had to wear hats; now they all three found it necessary to take to the topees which had been specially prepared with straps to fasten under the chin for flying. The shelter of the British Consul's house alongside the aerodrome gave us grateful relief, but the duties of refuelling could not be evaded. Petrol had to be brought from the store on donkeys. There were no chamois leathers for straining it. We decided not to leave the job to natives but to do it ourselves, and in the heat of the day climbed on to the wings and poured tin after tin into the tanks, using our handkerchiefs as strainers.

When this was done, the local officials took a hand. They raked over the aeroplanes for contraband, examined the seals of our cameras, inspected passports and demanded certificates of bodily health on all the more important counts. It seemed to matter very little that we had been approved at Bushire, and it didn't occur to us to seek to purchase clean bills of health on the spot. The Air Commodore's method was to use plenty of bluff and a little blarney and eventually to divert the conversation into other channels. In the end he closed the inquisition by supplying a wealth of statistics about the aeroplanes—horse-power, load, tankage and the like—but even his impressive calm broke down when the zealous official, thinking no doubt of ships, asked how many rats he had aboard.

As the result of all this bother we were a little less deliberate in taking off than was usually the case. The handkerchief Clydesdale had used for straining the petrol lay drying in the sun on the after part of the Fox Moth's fuselage when he started up the engine and the slipstream flung it back

among the control cables near the tail. A few minutes after taking off he discovered through the stiffness of the elevator control what had happened, and landed on a patch of sand to extricate the handkerchief. The landing itself was easily made and, wishing to waste as little time as possible, he took off in what he thought was the same direction as at Bandar Abbas, but by this time we had come farther round the bay and, instead of meeting the land breeze which he expected, he found, as soon as we were moving, that there was a stiff sea wind almost at right angles to his line of flight.

As soon as the take-off run began, he became aware of the cross wind and did what he could with the controls to counteract it. Ultimately the machine bumped into the air off an uneven piece of sand before it had full flying speed, and immediately took a drift which made pilot and passengers anxious as to the fate of the undercarriage if it should touch ground again. Clydesdale said afterwards that for a second or two he held the stick, not daring to ease it forward to gain speed or pull it back in case the wheels should lose their six inches of height and touch again. Had this happened the undercarriage would certainly have been wiped off. With the tail down, the speed gradually increased and half the party rejoined the other two machines in the air.

We went on, determined after our experience at Bandar Abbas not to put down again in Persian territory if it could be avoided. Our aim was the long run to Gwadar, just over the Baluchistan frontier, where it was likely there would be fewer formalities and where we believed a rest-house would be found. On this stage the rock architecture was even more striking. Until becoming accustomed to the scenery, we were constantly sighting towns and hill fortresses which proved not to exist. Towers, domes, battlements and even cathedrals presented themselves to the eye and then turned out to be

only strange rock shapes, cut by the tropical storms of centuries and fretted by the sand-laden winds.

These sights were a refreshment on the long hot journey, yet on settling down on to the landing ground at Gwadar just before dusk we were conscious of the need of more tangible refreshment and for that we were doomed to wait for four and a half hours. We had covered about 850 miles that day. Our labours in the noon-day sun at Bandar Abbas had left us thirsty and we had gone right through the hot afternoon without food or drink. At Gwadar we found ourselves stranded eight miles from the little town. A one-roomed hut stood on one side of the aerodrome and behind it were a couple of wells. The temptation of those wells we resisted, and it was a good thing that we did, for, on using some of the water next day for washing, it was found to contain various wriggly things which suggested the corkscrew sort of troubles from which the internals of Hughes (now fast recovering) had suffered. We found there was no road to the town. Darkness was coming quickly, and the prospect of an eight-miles trek across country in search of food and shelter was not a pleasant thought.

To our relief the rest hut, so uninviting that we had scarcely given it a second thought, was provided with a telephone. By this means contact was made with an official who, we gathered, was at the Gwadar Post Office. He succoured us though he never saw us, and trusted us to repay him the cost by placing a sum of money to his credit in the Bank of India at Karachi if and when that port was reached. This seemed to us the high spot in the many tokens of kindness met with on our journey. On two camels and two donkeys, provisions and bedding were brought out to us and with them came a cook and a "boy." These settled down at once to prepare an evening meal while we seized

the bottles of tepid beer and mineral water they had brought and quenched the savage thirsts endured for many hours. The cook soon had a fire going and pots boiling over it. The "boy" produced white linen and cutlery and made the rest-hut look more like a civilized dining-room than had seemed possible. At 11 p.m. we sat down to a five-course dinner which gave no sign of the conditions in which it had been prepared and, having drunk everything the bottles contained, began to make our beds.

None of us could face sleeping in the hut. It was too obviously in need of spring-cleaning and its atmosphere was too much tinged with the mixed odour of oil lamps and stale food. We had received from our benefactor a blanket and a sheet each, and a couple of camp beds had been discovered in the store. Mrs. Fellowes elected to sleep in the Puss Moth. The rest of us, tempted by the clear night and a big-moon, decided to sleep in the open air. As a night of rest it was most satisfactory. Clydesdale probably slept too well and was quite unconscious of the condensing moisture which was to delay his toilet next day. No doubt it was the clean sheet that deluded him into assuming that he could take a night in camp as he might have taken a night in a hotel. He slept in pyjamas with his bed close to the Fox Moth, and hung all his clothes on the wing for the night.

Shepherd was the only one who realized during the night that dew near the Persian Gulf might be as heavy as a Scotch mist in the Cairngorms. He had settled down under an aeroplane wing, but was awakened by the steady drip of moisture from the ailerons. He wisely put on the clothes he had shed, shifted his bed out into the open, piled on a travelling rug and overcoat, and was reasonably dry when he got up in the morning. When Clydesdale awoke, water was dripping from

all his clothes and had completely saturated his jacket and trousers.

The sun soon came up to clear the mists and dry the party, but it seemed a pity to waste the hours, and Clydesdale refuelled his aeroplane before he dressed. He gathered unmistakably from the ribald remarks of the party that the sight of a man in pyjamas standing on the top wing of a Fox Moth while natives passed tins of petrol up to him, and his clothing flapped on bracing wires in the morning sunshine, was more likely to move the onlooker to mirth than to sympathy. Later, we collected shaving water from the cook, took turns at using the mirror Mrs. Fellowes produced from her hand-bag, and gradually became fit to sit down at breakfast. M'Intyre, as usual, had saved himself from inconveniences by building himself a bed of planks with a tarpaulin canopy and from standing in the queue next morning by discovering that the metal airscrew of the Moth could be made to serve as a shaving mirror. He had time to work out our next course on the course-and-distance calculator and to study the map of the last 300 miles to Karachi before breakfast. His forethought and ingenuity were to be of immense value to us in the job we had in hand, and other members of the party were impressed with the wisdom of choosing him as second pilot in the course of that rather difficult journey to India.

It needed only three-hours flying to finish the trip. We met a patch of low cloud on the way and, as it was not too thick, we followed M'Intyre through it. Karachi was easy to find. The trip was so short that when we sat taking luncheon in the Sind Club it was difficult to believe that we had been roughing it 300 miles away only a few hours before. We were to stay in Karachi long enough to lose the feeling of the caravan, and though there were subsequent occasions when emergency jolted us out of our grooves, most of our

adventuring had in fact been done when we arrived in Karachi. The trip had been fascinating and its anxieties had not prevented our enjoying it. Such a trip may be recommended during the next few years, before the regular routes become too well organized, to any who seek new experiences or would like to recapture something of the sensations of travel in earlier times without having to devote the same length of time to it.

CHAPTER IV

ASSEMBLY AND THE FLIGHT ACROSS INDIA

We reached India on 5th March, but we did not assemble as a complete party at the Purnea base until the 22nd. Between those dates many things had happened and we had suffered our first real misfortune by the loss of the Fox Moth in a storm at Allahabad. That was the only one of the five aeroplanes used by us which suffered any damage in the course of the expedition. That may be attributed in part to good luck, for any of us might have found it difficult at times to avoid a collision in the air with one of the numerous kite-hawks. Clydesdale had on one occasion to rescue the homeward-bound air mails after a kite had smashed a strut of the Moth which was carrying them from Delhi to Karachi. On the other hand, we were entitled to some credit for our careful handling of the big Westland machines, particularly as the big airscrews cleared the ground, when the tails were down, by only 9 in. A very slight misjudgment in taking off or landing might have done irreparable damage to these precious aeroplanes.

The main task of the pilots at Karachi was to become thoroughly acquainted with these aeroplanes and to practise the various routines for all possible emergencies, so that there should be no delay through thinking things out in the air—a proceeding which might have been fatal at a height of 30,000 ft. Before a start could be made with the practice, the machines had to be unloaded at the docks, taken the nine miles by rail to the R.A.F. depot at Drigh Road and there assembled. As these processes seemed likely to occupy a few days, the Air Commodore packed us two pilots off

to Purnea on a flight of survey and exploration. These two had just enough time to settle into very comfortable quarters at the Sind Club and to supply themselves with servants and then they set off. Contact with personal servants gave us all our first close insight into the Oriental mind.

M'Intyre and Shepherd decided to share a very superior and expensive one. He was an excellent fellow and, by the testimony of his references, had acted as trusted servant to half the distinguished Europeans who had visited India and several whom we were reasonably certain had not. He wore spectacles which gave him a most distinguished and honourable appearance, and the only faults his masters could find in him were those petty dishonesties which our ignorance of Hindustani invited, an untruthfulness in the small inconvenient things, laziness of the kind more properly described as inertia, and a strong smell of garlic which accompanied him everywhere and was particularly aggressive in the fresh sweetness of early morning. The Air Commodore and Mrs. Fellowes acquired a bearded patriarch whose experience was no less valuable than his appearance was venerable and benevolent. Clydesdale had a dapper little Hindu less expensive but possibly no less dishonest.

For a day and a half we did no flying and the change was curiously welcome. Then, feeling refreshed by the short holiday, the two pilots set off to survey the route across India, check over the supplies of special fuel and see that everything was in order at the base camp. We took the Fox Moth and Clydesdale's Gipsy Moth—ABZK, which at the time of writing is still giving excellent service to another owner in England. They intended to leave ABZK at the base camp and return together in the Fox Moth. Their joint account of that journey led to the compilation of the following description.

The flight across the Sind Desert to Hyderabad, Uterlai and Johdpur was uneventful, though it reminded us of the continuing need of careful navigation in a land where landmarks are few and the distances between them are great. We stayed over-night at Jodhpur as the guests of the Maharajah, one of the princes most devoted to flying personally and to air transport generally. His aerodrome is a model and the hangars which house his own private aircraft besides those of the Johdpur Flying Club are as handsome as many an art gallery.

There still remained two hours of daylight after we had attended to the machines, and we devoted them to visiting the fortress-like old palace which we had noticed high on its rock while we were in the air and many miles away. It was a little reminiscent of Edinburgh Castle, standing on a precipitous hill dominating the native town and surrounding country. It looked exactly the sort of place to have survived the invasions of many generations. We found few signs of its war-like history, but near the great entrance gates we noticed tokens of the ancient custom which, for centuries, laid the burden of suttee on Hindu widows. These consisted of many small silver hands in relief on the stonework. They told their own tragic tale. When the ruling prince died it was customary for his wives to leave the imprint of their hands at the gateway as they passed out to throw themselves on their lord's funeral pyre. Only their hands and perhaps their children remained as witnesses of fidelity which endured even beyond death. Aviation seemed far removed from such fatalistic heroism, yet there below was the Maharajah's aerodrome, provided, too, with a purdah room from which the present Maharanee might see the flying without being seen.

Next day we flew over barren desert, aridly relieved at intervals by salt lakes and rocky hills, to Delhi where Blacker,

resolved to do no more journeys by train, was awaiting us. He had arrived at Karachi by Imperial Airways and had gone on to start checking the arrangements. We three continued together by way of Gaya to Bhagalpur, the headquarters of the District Commissioner and the original of Jos Sedley's Boggley-Wollah. There already Etherton was busy with his organizing and thence we went on as a party of four.

From there it was only a half-hour flight to our base camp at Purnea. Others had been at work for some time in our interests and things looked promising. The landing ground at Lalbalu was ready and an army of coolies had begun to pitch the big canvas hangars which were to house the Everest aircraft when they should arrive from Karachi. Mr. H. G. Came, Government Inspector of Works, had prepared the base camp with wonderful speed and efficiency and the Shell organization had laid a trail of special fuel right across India. We flew north as far as the Nepalese border and searched for an advanced landing ground, but came to the conclusion that we could not improve on the one which had already been provisionally selected for us at Forbesganj. This we approved and arranged to have levelled, marked and stocked with a supply of petrol in case we should run short on a return flight from Everest.

Having satisfied ourselves that everything was in order, we left the Moth ZK in a hastily erected canvas hangar in the grounds of the Darbhanga bungalow and returned that night in the Fox Moth to Bhagalpur to enjoy the hospitality of the Commissioner, Mr. John Dane, with whom we left Etherton. Next day with Blacker added to our party, we started the journey back to Karachi and reached Allahabad, where we suffered the only accident to an aircraft throughout the whole expedition. We had picketed the Fox Moth down with strong ropes in cement blocks embedded in the ground at the aero-

drome for the mooring of aircraft and left a guard in charge. Just after dark a tropical storm broke suddenly over Allahabad with tremendous force.

The guards hung on to our aeroplane until they themselves were in danger of being injured. Ultimately it was torn away by the hurricane, carried about 100 yards, turned over and dashed to earth upside down. As soon as the storm broke, we fought our way out to the aerodrome. Trees had been uprooted and houses destroyed, so we knew before arriving that there was little hope of our Fox Moth having escaped injury. We groped about in the darkness until we eventually found the cement picketing blocks and broken ropes but no Moth. With the help of the lightning flashes, the guards pointed to the heap of wreckage, and we saw that little could be done with it that night.

In torrential rain we tied down the wreckage against further onslaught of the hurricane and then returned to the town for dry clothing and a night's rest. Next morning we went back the eight miles to the scene of the disaster to arrange with the aerodrome authorities for the care of the remains until a decision could be taken as to their disposal. We were quite upset at the loss of the machine. It had served virtually as our lorry. The loads it had carried without protest had made it almost indispensable. It had never let us down. Its engine had given no trouble. Twice it had chosen playfully to give Clydesdale and Shepherd a shock by coughing ominously when we were just too far from land over the Mediterranean and the Persian Gulf to glide to safety, but that was merely its idea of a joke, and we had very good reason to be grateful to it for much faithful service. It was sad to have to leave so useful a member of the party in such a state of fracture and dislocation. We ourselves were needed at Karachi and there was no choice but to leave it in good

hands and rearrange our own plans. We were about 1,100 miles from Karachi and turned, humiliated, to the railway.

Four hundred miles of heat, dust and flies between Allahabad and Delhi served to reinforce our devotion to flying. Blacker knew all the tricks of railway travelling in India and even his experience seemed unable to ease the discomfort. We began to understand why, after a couple of railway journeys across India on the expedition's business, he had sat down in Delhi and demanded to be flown back to Karachi. We resolved now to try to get back into the air at Delhi, and in this matter Clydesdale and Blacker were fortunate.

They persuaded an Indian owner-pilot to take them back to Karachi in his Puss Moth. There was no room for M'Intyre, but he managed to buy himself a seat in the Royal Indian Air Mail plane. This was not as luxurious as it sounds. The mail aeroplane provided at that time by the Delhi Flying Club, was in fact a very ancient little under-powered light aeroplane, painted red and piloted by a well-known Indian pilot, Mr. Sherma. M'Intyre was placed in the little second cockpit forward with a red-hot exhaust pipe passing within a few inches of his face to add to the already unbearable heat of India. Then the Royal Indian Air Mail, in canvas mail bags, was tucked all round him and over him. Everywhere a mail bag touched, he perspired freely, and that was everywhere.

M'Intyre's own account of that trip is eloquent of the conditions in which the first air service in India was operated. Describing the flight, he wrote: "We sneaked along the railway line at 70 m.p.h. or so and eventually arrived at Jodhpur where I sorted myself out from the mail and refreshed myself with a cooling drink at the flying club while the mail plane was refuelled. Then came another five hours in the sweltering heat along the railway line to Hyderabad (Sind). Here

the pilot elected to stop for the night. That was all right for him; he had a cold cauliflower or some such vegetarian delicacy in a vacuum flask for his evening meal and a space reserved for his slumbers on the floor of the native rest-house; but no arrangements had been made for the passenger.

"The local postmaster, whom I consulted, could speak English and was able to explain that, though there were no hotels, one of his greatest friends was the proprietor of an eating-house and might be able to help. More contact with the mail, but on top of it this time, on the extreme rear of the postmaster's already overloaded tonga. The little underfed pony at one end of the tonga and myself at the other played a kind of see-saw game over the bumpy roads to the town. Sometimes the game little pony was trotting merrily in thin air, sometimes it managed to make contact with the road and at intervals I trotted, not so merrily behind, retrieving mail bags. The postmaster in his happy position amidst his enjoyed the fun and games.

"His friend of the eating-house proved to be an enormous fellow and full of bright ideas. Physically, he seemed to me an Indian version of Long John Silver. He was most keen to help me. His establishment did not boast a bedroom, but the resourceful gentleman undertook to build one in a very short time. Soon a most peculiar erection protruded into the roadway. Sacking, which had seen service of many sorts and in many places, was nailed on a structure of nondescript timber, and this was set as a lean-to alongside the eating-house. The inventory of furnishings amounted to one truckle bed and a jug of discoloured water. After a thorough combing of the bazaar this was augmented by one mosquito curtain. I find one always feels more detached from the world and the problems of its insect life beneath a mosquito net.

"I made a modest meal of a number of undersized boiled

eggs and retired early to bed, not that the bed was particularly attractive, but it suggested an attitude of repose and was less disturbing to the senses than the scenes, smells and noises inside the eating-house. Everything went well until the inhabitants of Hyderabad discovered that there was something new in town, something against which they might lean and rest their tired, perspiring backs, with a great expanse of roadway all around it to afford excellent opportunity for them to indulge their favourite pastime of expectoration. Judging by the sounds, a special competition must have been in progress aided, no doubt, by constant mastication of the betel-nut to add colour to the proceedings.

“This performance added to long, noisy arguments, brawls, fights and the threatened collapse of the bedroom at any moment did not improve the prospects of sleep. Having slept occasionally through the noise of an aeroplane engine, it occurred to me that the undersized eggs and night starvation might be a contributory cause of my insomnia. In any case, I went out, eventually, into the starry night to rouse the pilot in the rest-house and suggest a night flight on to Karachi. He seemed willing to humour his passenger, and away we went into the blue darkness of early morning. After a time spent in the dirt, smells and pestilential flies of a native town, there is no greater pleasure than to get up high into the cool night air, take a deep breath and enjoy it. By the time we had crossed the Indus River twisting its way down to the sea like a great silver roadway, the darkness ahead was broken by the flashing beacon of the airport at Karachi. There we landed to my relief and satisfaction as dawn was breaking.”

It may be added, by way of brief comment on that account, that M'Intyre made no further attempt to sample native ways of life in the course of the expedition. Our return to

Karachi meant the resumption of an ordered life and the beginning of the period of training which was to keep us fit and to make us intimately acquainted with the aeroplanes destined to take us over Everest. We had a busy but pleasant time, and found ourselves involved in a series of social duties. So big a British centre as Karachi was bound to mean the making of social contacts. We owed a great deal to people in official positions for the smooth working of our plans, and were received generally with that kindness and hospitality which can mean so much to the stranger unfamiliar with the ways of a new land. Our days were well filled with work at the R.A.F. depot and with the giving and receiving of hospitality in the evenings. Mrs. Fellowes was invaluable as hostess and as guardian of the expedition's reputation in the delicate matter of courtesies.

The nature of the task we had set ourselves meant particularly close association with the R.A.F. officers. We found just that steady efficiency and thoroughness which we had already learned to expect of the Service anywhere and the traditional capacity of the British officer for using his leisure to advantage. The two week-ends spent at Karachi brought visits with officers of the depot to the island of Manora for surf-bathing and sun-bathing. A big box of provisions was taken down to the harbour, one of the queer little native sailing boats chartered, and away we went, usually on long tacks over the four or five miles to the island which protects the harbour. M'Intyre, who had kept a little boat of his own on the Clyde and sailed it among the lochs of the West Coast, was particularly interested in the primitive device used by the native boatmen to preserve their keelless craft from capsizing.

Sticking out amidships on the windward side was a stout plank and at the far end a sack of ballast was set, but if the

wind was at all fresh or gusty, this was supplemented by a member of the crew and sometimes by two. The human counter-weight shifted his position whenever the boat heeled over or recovered. If he was intended partly as a reassurance to the passengers, he failed signally in his office. Not only did his antics draw attention to the instability of the boat, but they led to some anxiety as to his own safety and that of the boat if it should have to put about hastily to pick him up. After our first trip, the temptation to deputize for the counter-weight proved too strong for M'Intyre and the organizer of these parties, Flight Lieutenant Geoffrey Tuttle. Thereafter, they perilously walked the plank during our crossings and several times were very near disaster when the natural bombardment from their companions became heavy.

The island of Manora is a narrow strip of land with a long stretch of fine sand on its seaward side. There the Indian Ocean casts its rollers against a beach which shelves very gently and affords the breakers a long and steady run. In the "cold weather" these provide magnificent surf-bathing; in the monsoon season, though Karachi does not suffer the worst manifestations of the Indian monsoons, the rollers are so big and violent that officers and men of the R.A.F. are forbidden to bathe at Manora. Our visits were made towards the end of the "cold weather." Day after day there was bright sunshine and clear skies, sunshine of that almost incandescent quality which demands the use of coloured spectacles and persuades the wise European never to go far without his topee. Throughout the whole sunny days at Manora our party, varying in number from six to a dozen, lived in bathing costumes and topees. The water was so warm that a limit to surf-bathing was set not by cold but by fatigue, and when the sea was abandoned for the sun-

shine, bodies were smeared plentifully with coco-nut oil and then laid out confidently to dry and brown.

To most of us surf-bathing was a new sport in which we soon acquired skill and, through our enthusiasm, grazed knuckles and knees on the sand as we allowed the rollers to carry our boards right on through the surf almost on to dry-land. Shepherd, at his first attempt, allowed the nose of his surf-board to sink and dig into the sand with the result that he suffered a prod in the stomach from the other end which winded him for a few seconds. M'Intyre, disputing with another member of the party in the water for possession of a board, scraped a shin and was compelled by those who knew the risk of infection in India, to have the broken skin treated immediately with iodine and properly protected. In general, those parties went merrily and smoothly. They were good for our bodies and for our minds because they diverted them from the anxieties and concentrations of the week's work of preparation and testing at Drigh Road.

They were also immensely enjoyable in themselves. When lunch-time came, we gathered round the big tuck-box and out of it came food and drink, crockery and cutlery. It was hardly a picnic, for we seemed to have everything we should have had in our quarters except tables and chairs. It was at one of these meals that we saw one of the famous kite-hawks help itself to a man's lunch before he realized there was a bird in the vicinity. We new-comers had heard tales of such deeds and had generally assumed them to be "tall." At Manora we had amusing proof of the daring and impudence of these birds, arising partly out of the protection given by law to them as the scavengers of India and partly out of their own remarkable skill in flying. No pilot in an Army Co-operation aeroplane ever made so good a job of picking

up messages with the hook suspended beneath the aeroplane as the average kite makes of collecting meals on the wing.

In this case the kite's victim was one of the senior officers from the depot. He had been in India long enough to have known the risk he ran in carrying his plateful of rations away at arm's length towards a shady corner. The process at these parties was to line up at the tuck-box, receive the lunch issue from the quartermaster for the day and then pick a careful way over the rocks with bare feet to a sheltered spot. Off went the squadron leader, bearing aloft a big plate of cold chicken, ham, potato salad, green salad and tomato. His eyes were naturally on the ground; the eyes of half a dozen kites, poised overhead, were fixed on the plate. Suddenly, one of them fell out of the formation, dived, flattened out over the plate and swept everything off it with its talons as it slid past.

All but a few inconsiderable fragments remained clutched in those claws as the big bird climbed out of reach of reprisals. It could then be seen calmly gliding about and feeding from the hoard within its talons, while a roar of laughter from our party paid tribute to its skill and to the very real expressions of surprise and dismay which appeared on the victim's face. He secured a second issue of food but was conscious all that day of the indignity put upon him, a pilot of more than 15 years' service, by an aerial brigand hatched only two or three years ago; and we on our part soothed him dubiously with the assurance that the raid would never have been made if, instead of a bathing costume he had been wearing his uniform with the marks of his rank clearly visible to any marauding fowl.

There were half-hearted suggestions that this tribe of kites should be punished by playing on their greed. It is said that if two pieces of meat are tied to the ends of a yard of string

and flung up to the hovering kites, a terrible tug-of-war between two of them will ensue and may end in the death of them. Once swallowed, the meat and the string cannot be easily disgorged and the battle for possession may continue in the air and on the ground until the birds inflict serious injury on each other. Actually, we had enjoyed the joke too well to feel any need of revenge and the day was too good to breed cruel pranks. When our meal was finished, we amused ourselves by flinging the scraps to the hawks as people throw food to the gulls on the Embankment, and after a long, exhilarating afternoon among the breakers, trudged back over the sand hills to our boat and the belated cup of tea, highly flavoured with chloride of lime which the depot at Drigh Road could always be relied upon to produce.

Our debts to the officers at Karachi will probably never be repaid. Not only did they make life pleasant and secure for us by taking us under their wing and giving us the benefit of their experience, but they relieved us of endless trouble and anxiety by taking over the task of assembling our big aeroplanes and preparing them for the long journey across India. Their polite affectation of indifference towards the task we had set ourselves did not diminish their keenness to see our machines properly prepared and the N.C.O.s and men of the depot were equally ready to work and perspire in the heat and to go without time off when that was necessary to maintain the time schedule. When, on his first attempt at a test flight in the P.V.3, Clydesdale found that the electrical generator was not working, the squad of men who had expected to go off duty for the afternoon returned to their labours and spent another two hours in getting the generator into proper order.

The interest of handling new types of aircraft and engine no doubt contributed to this willingness. The P.V.3 and the

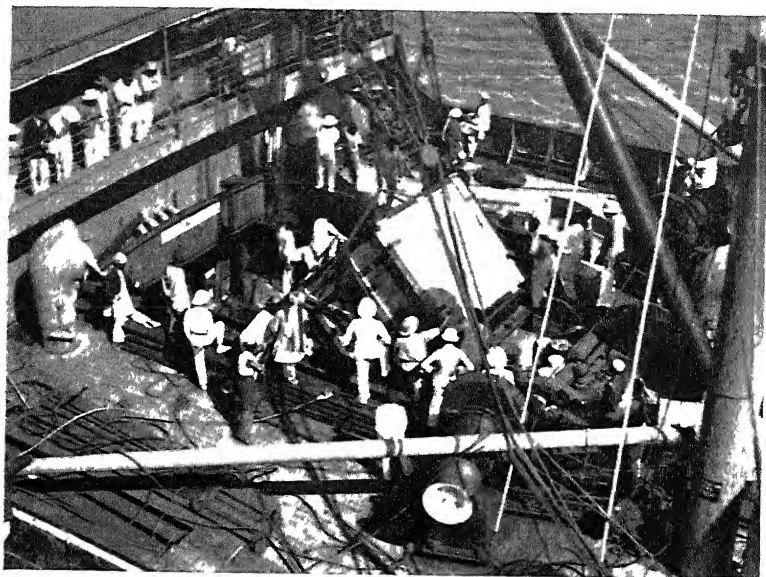
Wallace were the only specimens of their type in India at that time and the Pegasus, similar in general design to the Jupiter, so well known in India, was such a vast improvement on it that all the fitters on the station wanted the chance to look it over. Nevertheless, the quality of the assistance we received was not to be explained simply on the ground that our job represented a break in routine and a chance to handle novel equipment. It marked the good feeling which the Service breeds among those who fly and the admirable training given to all who belong to it. We appreciated it and were very grateful for it. When once the aeroplanes had been got to the depot, the work went along very quickly. The Wallace, for instance, was assembled and made ready to fly in three days.

That was an excellent piece of work and was of particular value because it gave M'Intyre the chance he had not been given in England of getting used to the machine and of testing it and its equipment thoroughly. The Wallace, after it had been adapted to meet our requirements, had been given only one rather short trial flight at Yeovil by Mr. Penrose, the Westland test pilot. It had not been flown at all by M'Intyre. He was, of course, quite familiar with the Wapiti, which it resembled fairly closely, but we both had to get used to handling the new engine so as to get the best out of it, and to taking off and landing carefully in view of the small ground clearance of the special, large-diameter airscrews. We had also to acquire the particular technique of high-altitude survey flight, obtain sufficient practice to be sure of doing the right thing automatically in an emergency and discover any peculiar characteristics in the mass of special equipment we were carrying. The Wallace was, in fact, ready for flight before M'Intyre got back to Karachi after the ill-fated trip in the Fox Moth and the work of assembling the P.V.3 had

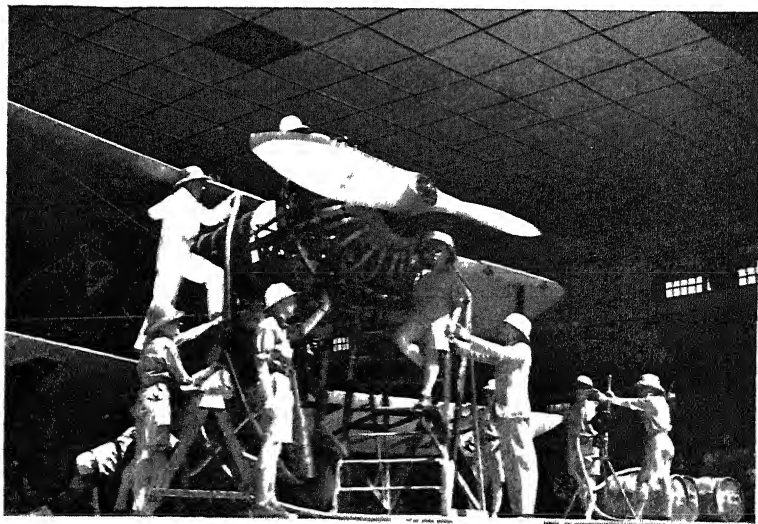
been pressed on. So the two machines were tried out on successive days and our plans progressed apace.

Here in Karachi we began to grow into the bigger party which was to live and work together for rather more than a month, and we began to grow acquainted with the extra members who had found their way to India independent of us. The film unit had reached Karachi ahead of us and had established itself with the monopolizing assurance of film men in one of the biggest hotels. Magnificent in their complete lack of self-consciousness, they began to take charge of us and, as meekly as might be, we rearranged time-tables to suit their needs, posed occasionally as they desired, pushed machines in and out of the hangar for this shot or that and climbed into and out of heated flying suits. Almost the first man to greet us when we landed in our Moths at the civil airport was Geoffrey Barkas, the film director, already famous in his own sphere. We were soon to recognize, in his complete absorption in his task, part of the secret of his success. He knew exactly what he wanted in every situation. It was often more than we could easily give, but he never hesitated to ask for it and he never stopped trying to get it until the best possible attempt had been made.

We soon began to feel that we had disappointed Barkas from the start. His side of the business was already running smoothly by the time we arrived. He had chartered (or commandeered) a Ford lorry and with it a small band of native porters and labourers. He had fitted it up to resemble in primitive fashion a mobile sound unit and had dragooned his native corps so that it worked quite efficiently in setting up the strange apparatus in readiness for recording wherever work was to be done. With him was his band of half-a-dozen skilled assistants, all clearly instructed as to their own individual duties, all ready on every occasion to fit themselves like



Aircraft in their big packing cases being unloaded
from s.s. Dalgoma at Karachi



Air Commodore Fellowes supervising the assembling

cogs into the general scheme, all, we suspected, a little contemptuous of the amateur actors whose exploits they were to record; all that is with the exception of Sidney Bonnett, the cinematographer, who had been nominated for the first flight over Everest. He had taken part in important flying expeditions before and, whatever he might think of the individuals on this trip, he knew from experience something of the difficulties of the job and appreciated the need of compromise between the sometimes conflicting interests of aeroplane and camera. Arthur Fisher, who had also been chosen as cameraman for work in the air, knew something about flying, too. He had had adventures in many parts of the world, had crossed the Andes on a mule and gone up the Amazon for hundreds of miles in strange craft, and some of us doubted whether he thought much of the chances our expedition would offer him or of its prospects as an expedition at that time.

The days in Karachi at least brought us together and began to reveal us to each other. The process of linking up with the film unit even had a sartorial effect on the little party which had flown from England to India. Barkas, when he welcomed us, had worn a tussore suit done in a lovely pastel blue and that delicate blue was often seen on the R.A.F. aerodrome and in its hangars, pursuing the dusky crew of the Ford when work had to be done or conferring with the Air Commodore, or arranging with officers and aircraftmen for certain shots to be made. Like the air of a popular song or a new catchword, that shade of blue haunted the minds of two of our number and made them conscious of limitations in their own rather meagre wardrobes. M'Intyre and Shepherd eventually slid off into the town for cotton suits in soft greens and creams and then, feeling perhaps that they had still not done themselves justice by artistic standards, swung away to the depot tailor for khaki shorts. It was in shorts and

shirts that we did most of our work thereafter and the shorts were nearly the undoing of Blacker and Bonnett when at last we took our big machines up for their first trial flights over Indian soil.

Their experiences of the electrically heated suits at home had not been concerned with bare knees. Now, first Bonnett and then Blacker climbed into their suits with only shorts and shirts beneath them, plugged in the electric leads and, when temperatures fell, switched on all the heating elements. It was some time before Bonnett realized that his bare knees were not inside the flying suit and not until he knelt down to open the hatch in the floor and experiment in photography from that perilous position did it dawn upon him that his knees were being scorched. He switched off the current from the boot heaters, preferring cold feet to burned knees, and when he came back to earth, rather ashamed of his blistered knees, he said as little as possible about that mishap. So it happened that, though Shepherd spotted it and noted it, Blacker did not. Unwarned, he went up with Clydesdale next day on the first flight of the P.V.3 and suffered in almost exactly the same way. Before those suits were used again, we had the heating elements removed from the knees and there was no more scorching of knees, though M'Intyre on the first flight over Everest blistered the back of his right hand. In all other respects our trial flights gave us the utmost satisfaction.

The first high-altitude test after our arrival in India was made on 15th March. M'Intyre took the Wallace, with Bonnett as his observer, up to a height of 34,000 ft. The weather was good, but there had recently been some dust haze and there was not the remarkable visibility which we were to find on some of the subsequent flights. M'Intyre reported on his return that at the greatest height he was able to see only

about 40 miles, but the climb was most successful. A height of 34,000 ft. meant that we should be able to clear the summit of Everest by nearly 5,000 ft. The time occupied in the climb was likewise satisfactory. It took M'Intyre about 90 minutes, adopting the comparatively easy rate of climb we intended to adopt on our main flight, to get to that height. His oxygen and heating apparatus worked well. The survey camera was tried and seemed to behave properly though the air temperature at the top of the climb was minus 45 deg. C. M'Intyre made a leisurely descent and, after making his detailed report, went away to eat a hearty lunch. He was pleased with the machine and Bonnett was satisfied about the photography side, except that he would have liked a closer-fitting oxygen mask when he had to stand with his head and shoulders above the cockpit.

Next day Clydesdale and Blacker took the P.V.3 out for its trial. As soon as they took off, Blacker began to go through the routine tests and found there was no current for the heating elements of their flying suits. They returned to the aerodrome and handed the machine over to the mechanics again. The aircraftmen concluded rightly that the trouble was in the generator and soon had this unit uncovered for examination. The defect proved eventually to be a bad contact.

Examination and adjustment occupied some time and when the machine was ready again to start the flight, lunch-time had passed and pilot and observer had had nothing to eat, the day was at its hottest and their flying suits were a weariness to them. Clydesdale, nevertheless, decided to make this a full-length rehearsal and set the machine on the slow rate of climb which it had been calculated should allow them to gain the necessary height while covering the 160 miles from the base at Purnea to the summit of Everest. After 135

minutes of steady climbing they were at 35,000 ft. (corrected altitude). The weather was magnificent and they were wholly comfortable but for two things. Blacker had burned his knees. Both of them had, so to speak, lost an eye. The heating around the left glass of Clydesdale's goggles and the right of Blacker's had failed and the glasses had frosted over; but as they had one good pair of eyes between them, they were not unduly troubled.

At the greatest height they had an example of the magnificent visibility to be hoped for in favourable conditions. They could see far along the coast towards Gwadar. Blacker asserted that visibility in that direction extended to 150 miles. Inland, the flat yellow of the desert merged in the distance into a purple dust haze, but beyond that was an expanse of blue sky, edged at its northerly extremity by white clouds resting perhaps on distant and invisible peaks. The observer took photographs with all the cameras the machine carried and Clydesdale ran the vertical camera for a short time. Although they were flying in the heat of the day, the temperature was fairly low. The thermometer, fixed to one of the wing-struts, showed minus 39 deg. C., but the two occupants were snug in their cockpits, the cameras showed no disinclination to work and the engine, roaring away steadily, was evidently being well served by supercharger, fuel and oil.

They took 45 minutes to come down, so that pressures might be the more gently adjusted and they landed, hot and a little tired after a flight of three-hours duration—just about the time they expected to need on the big flight. There were certain small adjustments to make and it had originally been intended to make two or three short flights to test them, but all the main items of equipment had proved fit for their tasks and we decided that we could prepare to move on.

First, it was necessary to arrange that the special supplies

of doped fuel should be ready for the Pegasus engines at all our possible halts. The big engines were tuned to use the leaded petrol and we had no intention of upsetting them with ordinary spirit. After the loss of the Fox Moth we were in some difficulty about transport and that difficulty was solved by the adoption as a supernumerary member of the party, of the oldest aeroplane in India, and by the sporting offer of Ellison to fly it and of Mr. A. S. Gallimore of the Burma Shell Company to travel in it as expert mixer of tetra-ethyl-lead with petrol. The ancient aeroplane, the second to be licensed in India, was in the care of the Karachi Flying Club. It had been flying since 1929 and at last, short of rebuilding, any hope of its obtaining a certificate of airworthiness was gone for ever.

Nevertheless, under Indian regulations, it could still be flown, and Major W. Jones, the flying club instructor, used it occasionally on his shooting excursions and lent it to such pilots as he considered fit to be trusted with such an antique. It was slow; its range was small; parts of it rattled and had to be secured afresh from time to time; it had to be handled with the respect due to old age and an Anglo-Indian temperament; but it promised faster transport for our mixers than anything else we could discover and they, rejoicing at the chance to avoid surface transport, treated the adventure as a huge joke.

Ellison had been of great help to us since he joined our party in Karachi. He had been allotted to us as third pilot by the R.A.F. in India. He was about to finish his tour of active service. He had flown service aircraft in several parts of India and had an excellent reputation as a pilot. In the event no member of the expedition proved more energetic or efficient. Since returning to this country his qualities have been recognized and at the time of writing he was chief pilot

to one of the busiest passenger lines in Great Britain. When the time came to move on, we left the fuel question to him and Gallimore and the veteran aeroplane. They arranged to keep a couple of hops ahead of us, so that there might be a margin to cover the slowness and any possible vagaries of the Moth.

Its airspeed was 75 miles an hour. It carried petrol for about 200 miles. At any time it might become necessary to do a few engineering jobs on airframe or engine. Against the risk of headwinds, Ellison always carried an extra six gallons of petrol in tins. It turned out that all the precautions were wise. They had at least one forced landing on the way across India because the petrol in the tank was exhausted before they could reach the next aerodrome; and at Cawnpore they had practically to re-rig the wings in order to take up the slack in the bracing wires. The story that they used fencing wire to replace that which had stretched most may not have been strictly true, but it expressed picturesquely the improvisations to which they were driven.

The short range of this old machine compelled the mixers to land more frequently than the rest of us. They could not, for instance, make the run from Jodhpur to Delhi without an intermediate call at Uterlai, or that from Allahabad to Bhagalpur without coming down at Gaya. We had decided to use the big machines carefully on the way to Purnea. We were to open with a short trip as far as Hyderabad (Sind) and then, if things had gone well, to move on by stages of 300 or 400 miles. The direct route would have taken us through Jodhpur, Cawnpore, Allahabad and over Patna to Purnea, but we wished to acknowledge the debts we owed to the Viceroy and so arranged to make the journey by way of Delhi, some 200 miles to the north of the direct course. Taking this route, the total journey amounted to about 1,500

miles, a distance which we leisurely covered in three days. The old Moth left Karachi a day before us and landed at Purnea only two or three hours before we arrived. It and its occupants had done a very fine piece of work. Later the veteran was flown back to Karachi by Gallimore.

The last few days in Karachi were busy for all of us. As M'Intyre said at the time, we "ate, drank and slept Everest." Now that we could feel sure of the machines, we had to become satisfied about ourselves. The Air Commodore's motto, "Do your thinking on the ground," was readily adopted. It was imperative that we should not find ourselves nonplussed in an emergency in the air. We had not simply to know what to do but to be reasonably sure that we should do it almost automatically. To that end we tested each other's knowledge and reactions, cultivating the habit of watching instruments and drawing the most likely deductions from the information they supplied and of deciding immediately on the appropriate course of action.

In addition, we had now to arrange for the transport of a fairly big party and of a load of equipment. The R.A.F. depot had supplied us with six aircraftmen, all skilled in one trade or another, to help maintain engines, aeroplanes and apparatus at the base. A quantity of spares had been sent out with the Westland machines. These with photographic material and our personal possessions had to be packed and stowed in the aeroplanes or despatched by rail. The official observers were to use the journey for practice in photography. We had only the Puss Moth as well as the two Westland machines (the Moth ZK having been left at Purnea) so that we could not take many of the party by air. Eventually we packed most of the suitcases in the big machines, each of which took also an observer and a mechanic besides the pilot.

The Puss Moth, flown by the Air Commodore, had Mrs. Fellowes and Shepherd as passengers.

Fairly early on 20th March, we took off from the military aerodrome at Karachi and headed for Hyderabad. The Puss Moth had already gone when we climbed up into the slight mist which quickly evaporated and left one of those hot, cloudless days designed to impress upon the human mind the vast monotony of the desert. Within a few minutes we had lost the faint outlines of the coast and the soft blue of the sea, and were plodding at low altitude over the dun wastes of the Sind Desert. There were very few landmarks and we set a compass course, secure in the knowledge that if the slight wind should drift us off it, we could be fairly certain of finding the River Indus sooner or later on our right. In fact, we made a very good course and came down over the white and picturesque town of Hyderabad to make our first landing about an hour after leaving Karachi. The Puss Moth had not landed here but had taken it as an aiming point for the next leg of the course to Jodhpur.

We found a large audience on the landing ground at Hyderabad and began to realize with mild surprise, after the indifference affected by the officers at Karachi, how interested people in India were in our project and our aircraft. The fuel which Gallimore had doped was waiting for us and was soon pumped into our tanks. The engines were restarted and away we went into the air which was getting warmed up and a little bumpy. For some three hours we flew over country which was nearly as featureless as the Sind Desert. It had more scrub on it and occasional little groups of hills. There were few good subjects to afford the observers photographic practice, but Blacker and Bonnett tried their hands at all possible shots, long and short, high and low, vertical and oblique; and we as pilots helped them by varying the altitude,

course and attitude of the machines from time to time. Occasionally we were flying at 10,000 ft., but more often we were down at a modest 4,000 ft. In the early afternoon we came in sight of the rock fortress of Jodhpur and gave the photographers chances to photograph the castle and the town from all angles. Then we slid to rest on the fine surface of the Jodhpur aerodrome and superintended the refuelling in the hot sunshine before accepting the invitation offered on behalf of the Maharajah to take refreshment and rest at the old palace.

The Air Commodore had landed the Puss Moth some time before us and had surprised the aerodrome officials by arriving from the wrong direction. He had been expected naturally to come in from the south-west, but he was actually sighted in the east. He explained this simply enough and his explanation emphasized the lack of landmarks in this dun-coloured land. The course he set from Hyderabad carried him about 10 miles to the north of Jodhpur. As the main face of the rock on which the fortress stands has a south aspect, Jodhpur formed no striking feature in the landscape when seen from the north. The Puss Moth consequently overshot the mark and the Air Commodore became conscious of this when he passed over a railway line which, according to the map, should be east of Jodhpur. He turned back and soon found the town clustering beneath its rock and the aerodrome not far from it.

It was pleasant to call at Jodhpur again and the hospitality of the Maharajah, though he was attending the Chamber of Princes in Delhi, made it still more enjoyable. He had asked Thakur Narpat Singh, one of his close relatives, to entertain us on his behalf. We found a fleet of Rolls-Royce cars waiting at the aerodrome and in them, when we had attended to the needs of the aeroplanes, we were driven to the old palace for

lunch. We were given rooms for the night, fine, well-furnished rooms, equipped with modern luxuries and with Western comforts, including adjacent bathrooms. During the afternoon several of us strolled across the grounds to the covered swimming bath and refreshed ourselves in really cold water. In the evening we drove through the native town and bazaar, marvelling anew at the comparative healthiness of a population which seems always to live in crowded conditions and to take no trouble to protect its food supplies in the market place from the swarms of flies. The degree of immunity from certain diseases which the human race can acquire in the course of generations of infection is one of the most astounding things in India.

That evening, when we had driven up the hill to look at the magnificent new stone palace, half-finished at that time, we dined sumptuously at the old palace. This was a dinner that might have been produced in a fashionable London hotel and we took it as a high compliment from a fellow-pilot. The Maharajah had made it his custom, ever since his aerodrome had been completed, to give hospitality to aviators who had to stay the night at Jodhpur and he had established a rest-house at the aerodrome for that purpose. We were specially honoured by being treated as his personal guests and we very much appreciated this mark of goodwill towards the expedition. The comfort of the palace might easily have caused us to vary our schedule and, indeed, two members of the party, who failed to wake at dawn, nearly upset the plans. They eventually tumbled into the last car for the aerodrome, clutching bundles of food in place of the breakfast they had no time to eat. For the second time on this trip, M'Intyre and Shepherd took their breakfast in the air as we made this time for Delhi.

This section of the journey also was free from trouble and

navigation began to be easier. Soon there were more landmarks and an occasional railway line to help us check our course. Villages and small towns were to be distinguished at intervals in the plains and away on our left we saw a few rugged hills. We left our direct course to skirt one of these ranges for the benefit of the photographers in the rear cockpits and at last we saw Delhi in the distance—the biggest and most striking city we had seen since we arrived in India. All the amazing contrasts of Delhi may be appreciated from the air. Its ancient monuments and its graceful mosques, particularly the huge and noble mosque of Jami Masjid, come strangely to the eye alongside the geometrical lay-out of New Delhi and the dignified and imposing architecture of its new buildings. Again, on the edge of the picture is the third impression of the native city huddling its buildings together as though safety and protection were to be found in close company. Here were subjects worth the attention of our observers and we made a few circuits for their benefit before we sought the aerodrome and settled down.

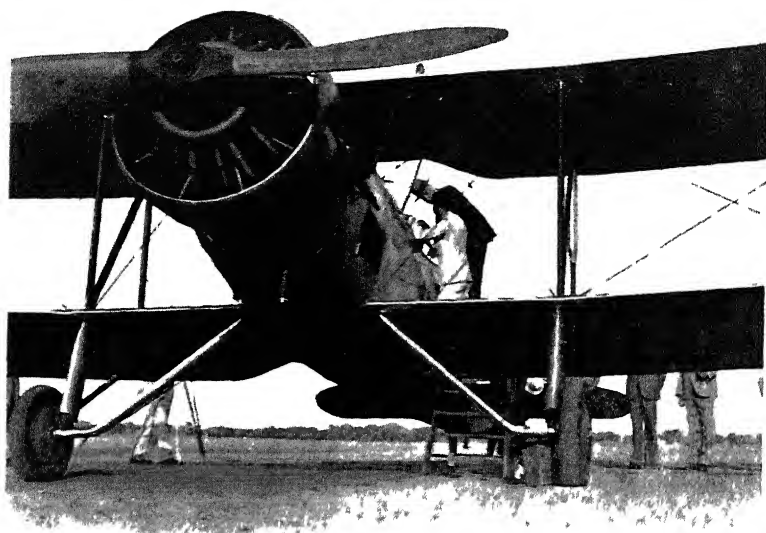
That afternoon the Viceroy (Lord Willingdon) came to the aerodrome to inspect the expedition for which he had already done so much. Without his assistance we should have met many more difficulties in India. To his approval and recommendation we largely owed the success of our application to the Nepalese authorities. Now he took us under his special care and to the honour of an official inspection, he added hospitality. Blacker was invited to stay at the Viceroy's house. The Air Commodore and Mrs. Fellowes were claimed by Captain F. Tymms, the Director of Civil Aviation in India. Clydesdale had already promised to stay with the Commander-in-Chief (Sir Philip Chetwode). We have very pleasant memories of the kindness we found in Delhi. Just before the sun sank, Clydesdale, M'Intyre and Shepherd went swimming

in the lovely pool near the Viceroy's house. This was the second fresh-water bathing pool met with in India. We hoped we might find another at our base, but little thought at that time that we should have one alongside the aerodrome, nor did we consider the risks to which such a boon might lead us.

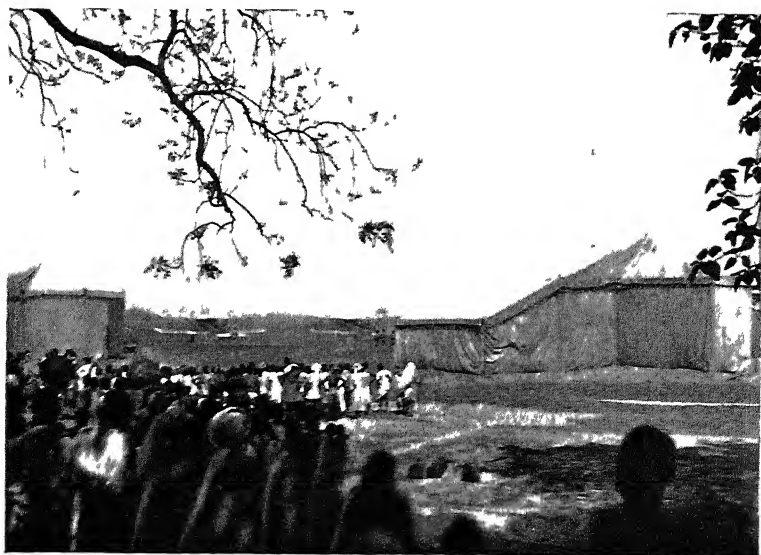
Early next morning we said our farewells and took off. The long flight to Allahabad was made by lunch time. With the big machines we took the direct course. The Air Commodore in the Puss Moth turned aside to Agra and gave his passengers a close view of the Taj Mahal—so close that Mrs. Fellowes took one of the best photographs of the famous shrine that we have seen. The arrival at Allahabad brought a definite sense of approaching the scene of our real work. From the air a fine view may be had of the Ganges and the Jumna as they advance to their confluence and of the swollen Ganges as it sweeps on towards Calcutta and the sea.

Once in the neighbourhood of the Ganges, we felt that our journeying was nearly done and that the great peaks that were our ultimate objectives might soon be seen. We knew that the Ganges would be our companion now for the greater part of the flight to Purnea and, allowing ourselves the small luxury due at a penultimate stage, waited at the aerodrome at Allahabad for cold luncheon to be brought out from the town. While waiting, some of the party strolled through the mango grove alongside the aerodrome and watched oxen immerse themselves in the muddy pool it sheltered. The Fokker of the K.L.M. on its way to Batavia also arrived while we were there and showed us its paces in a most spectacular take-off which made us thankful it had three engines and confirmed us in our resolution to take no unnecessary risks with our single engines.

Lunch that day was an affair of heat and flies. We took



Viscount Willingdon, Viceroy of India, inspecting the
aeroplanes at Delhi



Talbalu landing ground after the arrival at Purnea

possession of the passengers' waiting-room after the departure of the Dutchman and with us came swarms of flies. The days of comfort, it seemed, were over: the cities where efficient sanitation and the principles of hygiene were applied were now being left behind. Soon we should have to take our own measures for the preservation of health in a tropical land. It was refreshing to climb back into the coolness and cleanliness of the upper air and set course for Purnea. We passed over Benares and came to Patna. The Viceroy, who was about to pay his first visit by air to that city, had asked us to look at the Patna landing ground and advise him as to its suitability for landing the viceregal Avro Ten. We came down low to examine it and decided it should serve well enough. Then we went on past Bhagalpur and soon left the Ganges to strike across country towards Purnea.

Our course now lay over a brown land which might have been moorland, split by many streams and made sinister here and there by patches of bog. It was not good flying country and discouraged thoughts of forced landings. Our journey over it lasted little more than half an hour and then the face of the land changed. Ahead of us were trees and grass and patches of cultivation. This, as seen from the air, might have been an English scene. There were a few good-sized stone houses, straight white roads fringed with trees, and two rivers winding their way through a piece of fertile country. This was to be our base, remote in spirit from the mountains we had come to challenge, yet so near to them that our main task, once begun, might occupy no more than three hours. With our bigger machines we flew over the Darbhanga bungalow and its private landing ground and on nine miles farther east to the aerodrome at Lalbalu. Tent hangars had been erected there and very soon the Westlands were safely

stabled and we were driving along a dusty road to settle into our new bungalow quarters.

All the excitement of our arrival had been absorbed by the little landing ground of the bungalow. Ellison, in his aged Moth, had started the fuss. The whole native population assembled to greet him before he could get down and spread itself all over the surface of the landing ground as he glided in. Finding no place where he could safely set his landing wheels, he opened up the engine again and climbed up to circle round for a time in the hope that some authority might appear to instruct the people for their own safety. The landing ground continued to be a place of assembly and at last Ellison decided that fear must achieve what prudence evidently could not achieve.

He therefore dived the old Moth down across the landing ground several times, scattering the people at each attempt and gradually making for himself a clear landing path, only to find himself surrounded by excited people as soon as he touched earth. He could not taxi up to the tent shelters beneath the trees until he had harangued the people in the forceful Hindustani which the British officer finds it necessary to cultivate in India. And before he could put the machine under cover, hundreds of people had insisted on touching it and several little boys, just out of school, had stuck pencils through the fabric of the tailplane.

Ellison summoned police assistance in readiness for other arrivals and the crowd was held in check while the Air Commodore landed, but immediately afterwards it swarmed round the new machine and was with difficulty persuaded to make way for it. Our arrival was a local sensation. We had not expected to create such a stir and had no desire to be impeded by public attention in the work ahead of us. We were never to get quite free of this embarrassing interest

and the small as well as the big machines were ultimately removed to Lalbalu. Even that did not defeat the natives. They were fascinated and suspicious by turns, but they could not overcome their curiosity and it was impossible to convince them that we were ordinary human beings.

Our immediate concern was to get settled in our new home. We were the vanguard. The film people and most of the mechanics were in trains, making their slow way across India. There had been some slight misunderstanding about the date of our arrival and the bungalow was not quite ready, but within an hour Mrs. Tom Smith, the wife of a local planter, who had been asked by the Maharajah of Darbhanga to superintend our *ménage*, had mobilized house servants, prepared rooms for the party and produced tea. We quickly began to feel at home and to realize that, until setting off on our main adventure, we might expect to be fairly comfortable.

CHAPTER V

OUR BASE CAMP AT PURNEA

Life, during the month spent at Purnea, was a curious mixture of hard work and hard play, of steady routine and sudden emergency, of wearing anxiety and irresponsible relaxation, of high exultation and keen disappointment. How much was crowded into that month is only fully appreciated in retrospect. At Purnea we came wholly together as an expedition for the first time, welded ourselves into a homogeneous party both as an expedition and as a mess, organized and equipped our base and its communications, found amusing and helpful diversions, established friendly relations with the people of the district, paying visits and receiving them, and ultimately performed the tasks we had set out to do.

When we left to return to more prosaic duties at home, it was with a sense of real gratitude to the community of the Purnea area; and it is pleasant to know that our departure was regretted. It would perhaps be true to say that we made heavy demands on the district, that we disturbed its even tenour and in some senses diverted attention from every-day affairs; but most of the people welcomed the new interest we brought into the place and the fresh opportunities for social life which the arrival of a party of 30 men represented.

Purnea is just a small town, once the centre of a prosperous indigo trade and latterly sunk in the depression which followed the competition of synthetic dyes. Its white population had dwindled as the market for natural indigo contracted and the handful left behind were trying to readjust themselves and their plantations to the changed conditions. It was no

doubt an advantage that we should not find ourselves the objects of lavish hospitality at the hands of wealthy planters. The warmth of our welcome by white planters and native landowners was sufficient hint of the restraints we should have had to impose had we discovered Purnea in its hey-day.

Native hospitality took a practical form in the main. Our bungalow was lent us by the Maharajah of Darbhanga; a fleet of motor-cars by the Rajah Banaili. We arranged our own messing with a Parsee firm of caterers, but relied on the local police for supervision at the aerodrome and for messenger duty between the bungalow and the town. White hospitality was modest, taking the line that companionship need not depend on expensive entertainment and that help in the work being done would prove the most acceptable offering. We were indeed fortunate in the choice of our base.

On to this quiet little place we swooped like migrant birds on the bright afternoon of 22nd March and into it trailed the rest of the party during the next two days. With us came an attendant flock. Our servants and those of the caterer invaded the place. Post Office telegraphists, demanded by Shepherd for the proper service of *The Times* and the world-wide Press it had promised to supply, arrived from Patna to supplement the staff of the small post office. The R.A.F. men came in from Karachi and our doctor joined us from Ambala. Mr. Came, the engineer, was in residence so that he might confer with us concerning jobs to be done at the aerodrome. Mr. and Mrs. Tom Smith had moved in from their plantation at Kolassi to make certain we were comfortable in our temporary home. We felt like an invasion and no doubt gave that impression to the kindly people who received us so well.

With the train party from Karachi came our trunks and the boxes of stores and spares. Ellison, who immediately took over

duties of transport officer, was forced for the lack of better transport, to engage a bullock cart to move the luggage from the station to the bungalow—a distance of a mile and a half. As the bullock's pace was about one mile an hour, Ellison spent a whole day collecting our goods. We wondered at the time whether Barkas would have to accept bullock transport for his film and sound apparatus, but within three days he had discovered and hired the only motor truck in the place and established a lien on the only motor-'bus in the district, a shabby vehicle which had lost all its varnish and most of its windows.

The process of settling in was fairly soon over. The Air Commodore and Mrs. Fellowes went into semi-seclusion in a couple of rooms at the east end of the bungalow. The film party took possession of the corresponding rooms at the other end. M'Intyre and Shepherd shared a room opening off the drawing-room in the middle. Ellison and Captain R. Bennett, the medical officer, were their neighbours on one side; Clydesdale and Blacker were not far away on the other and next to them was a little place which Fraser, one of the aircraftmen, soon rigged up as a photographic darkroom.

Most of these rooms opened on to a pillared veranda facing south. Half the beds were dragged out on to the veranda at night and, when the moon was up, this looked more like a hospital ward than the place where our visitors took tea with us. At the back of each bedroom was a bathroom, stone floored and provided with a splashing pen and a hip bath. The water for this part of the toilet was drawn from a well at the rear, heated over a camp fire in petrol tins and then carried on primitive yokes to the bathroom which produced the loudest shouts for *pani*. Early morning was apt to be a time of noise and confusion. Ellison, full of vigour, made it a point of honour to prevent sleep after dawn. His gramophone

was always announcing some sentimental yearning or love-sick lament by 5.15, and if that were not sufficient, he went round rattling beds and personally demanding attention to the hour.

If he ever neglected his duty, M'Intyre was quite ready to serve as deputy. And if both had failed us, we could not have overslept for Tom Smith invariably rode over at dawn on one of his butia ponies to greet all and sundry in the voice of Stentor without dismounting. There was not an alarm clock in the bungalow and we were never conscious of the lack. The policy of early rising, put thus into effect, was sound. It was obvious that we should have to seize the chance of our flight immediately it offered and, although weather reports received overnight gave a fair indication of the next day's promise, we were prepared for any twist in the weather which might yield an opportunity.

As the whole party came to life at about the same time, each morning, the hot-water system generally worked at high pressure and the wise man took a turn round the estate while his bath water was cooking. The bungalow stood in the middle of a park which had been modestly adapted to serve as a golf course. From the veranda one looked out on to an enclosed garden, neatly laid out and full of flowers, including roses. Beyond it were tall, leafy trees which at a distance might have been taken as the elms of an English park. Beneath their branches could be seen the grass of the golf course which was used as a landing place for the smaller machines. In the rear were more trees, smaller in stature but adequate to serve as a screen between the bungalow's domestic affairs and the road, a quarter of a mile away.

The golf course was bounded on the east by the railway line which ran straight towards the Himalayas and ended discreetly a few miles south of the Nepal border. On the west a tree-lined road, leading to the Planters' Club, marked

another limit. The energetic man, driven from his bed by Ellison's gramophone, could take a trot of about a mile round the estate with some pleasure and the fairly certain knowledge that his bath would be ready on his return. The grass was short and the danger which made us uncomfortable on our night walks, of treading on a snake, scarcely existed at dawn.

After the first few days there was an additional practical reason for Ellison's early morning assertiveness. He had taken charge of all the transport arrangements and unless he kept cooks and chauffeurs up to the mark, the men camping at the aerodrome might have to go without breakfast. We began by pitching tents for the R.A.F. men near the trees in front of the bungalow, but found some difficulty in getting them to and from the aerodrome at the various times occasioned by their respective jobs and they themselves eventually suggested moving their camp to the site of their labours. Once again the bullock cart served the airmen in the removal of their gear, and when that slow process was over, the men quickly made themselves so comfortable that the thought of crocodiles and wild animals (against which they were supplied with rifles) was of far less consequence than the breakdown of the commissariat car or the fierce gales which kept them hanging on to their tents on two or three nights.

Upon Ellison fell the duty of seeing that these men were supplied with meals from our kitchen nine miles away. The motor-cars lent by the Rajah Banaili were in his command and schedules had to be arranged for them. These generally worked well, but one of the native chauffeurs was a constant trial to the transport officer. Whether by design or misfortune, he was a master at forgetting to fill up with petrol, at getting unexpected punctures and leaving his jack or spare wheel at home, at suffering neuralgia or the unbearable pangs



The first bathing pool which had to be shared with the elephants and village children



And the ladies of the village made it rather embarrassing

of hunger when he ought to have been starting out on a journey. As time could not be made up by driving fast in borrowed cars over the bad road to the aerodrome, Ellison's plans sometimes broke down and appropriate wrath, expressed in fluent if limited Hindustani, was the portion of the offender.

Had all the cars been as unreliable as that one, we should probably have been forced to obtain more tents and join the men in their camp. We were dependent on motor transport for a prompt start of the big flight whenever conditions should prove suitable. The Air Commodore depended on it for the very early reconnaissance flights he made whenever the weather forecast suggested the slenderest chance. The smaller machines were kept near the bungalow only for the first few days. That landing ground was unsuitable for regular use both because it was too narrow and because it was liable to be thronged with people the moment an engine was heard. The Moths were therefore transferred to Lalbalu and nearly all flights began and ended there.

Had the cars failed us, two unsatisfactory alternatives would have had to be considered. We might have hired one of the pony tongas or we might have borrowed bicycles from the policemen. By tonga the journey to the aerodrome would have occupied an hour and a half. By bicycle the time would have been about the same if the road and its pot-holes had not defeated us altogether. It would have been a great convenience to have been in touch by telephone with the aerodrome, but there was no telephone service in the district and there was no Government dump from which we might have borrowed the cable and instruments. If there had been, we were pretty certain the R.A.F. men would have laid a line.

The circumstances thus brought us into close personal

contact with the district. We had to call and see people when it was necessary to ask questions or invite help. They returned our calls and the planters very soon made us honorary members of their club—a long thatched building with a billiards table at one end, some card tables in the middle and a dancing floor at the other. The ladies of the district were evidently members and they quickly abandoned their cards for dancing when they found that some of our members were willing to take a little gentle exercise between sundown and dinner. This part of the proceedings depended on the regular attendance of owners of gramophone records. The gramophone might be left on the premises, apparently, but not the records; and Ellison, uninterested in dancing, reserved his blues and tangos specially for early morning performance. Whether dancing or not, most of us paid an evening visit to the club when there were not more pressing duties. It was only a quarter of a mile away across the golf course and against the risk of surprising a snake, we generally used pocket torches for the journey over the grass. Occasionally on a dark night, a torch failed and the victim either made his way cautiously and apprehensively home or made a detour to collect a hurricane lamp from Tom Smith. These precautions were by no means superfluous, for the house servants one evening found and killed a cobra in the drawing-room while we were at the club.

As the result of the contacts made, we were soon able to borrow gear for an occasional game of tennis on the club's hard courts or for a round of our own golf course. M'Intyre also found out fairly soon where swimming could be had and obtained an open invitation to pay visits to the "tank" on one of the Maharajah of Darbhanga's estates whenever we liked. The word "tank" so commonly used in India is misleading. This one was a pool prepared for the collection

and storing of water during the rains for use in the dry season. It measured about 300 yards by 100 yards and was fringed, as a natural pool might have been, by trees, farm buildings and native labourers' huts. The livestock, from chickens to elephants, were watered there. It served some of the domestic needs of the farm community. We had several pleasant afternoons there, although the doctor shook his head gravely when he saw the colour of the water and promised all sorts of horrors to any who should swallow a mouthful. On one of our visits, Barkas and his lorry of tricks accompanied us and a film of elephants, Europeans and native boys sharing the same pool was made. No doubt many readers have seen that interesting "short."

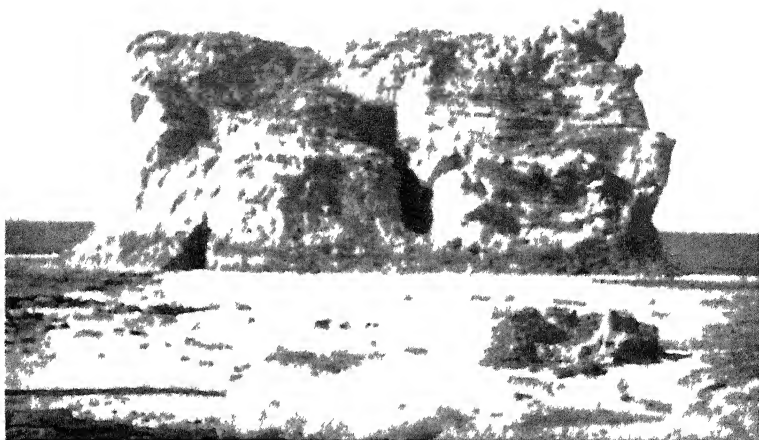
The exhibition of that afternoon was as fascinating to us as it may have been since to the cinema audiences. Both the elephants were old—about 70 or 80 years, we were told—and they looked forward to their daily tub. One was blind, but for bathing purposes sight mattered little. The huge animals were wholly submerged when they swam, with the tips of their trunks poking like periscopes out of the water and mahouts standing waist-deep in water on their shoulders, guiding them in the usual way. When their swim was finished they stood in the shallower water while small boys and some of our party swarmed on to their wet backs for the pleasure of sliding, jumping or diving back into the water.

This tank unfortunately was some 10 miles away and we could visit it only occasionally. Hence the joy with which M'Intyre discovered the possibility of turning a weedy pool alongside the aerodrome into a swimming pond. He enlisted Came's help and ultimately presented us with pool, diving stage and ladder. So it happened that when on 3rd April we came back from our flight over Everest, very conscious of the

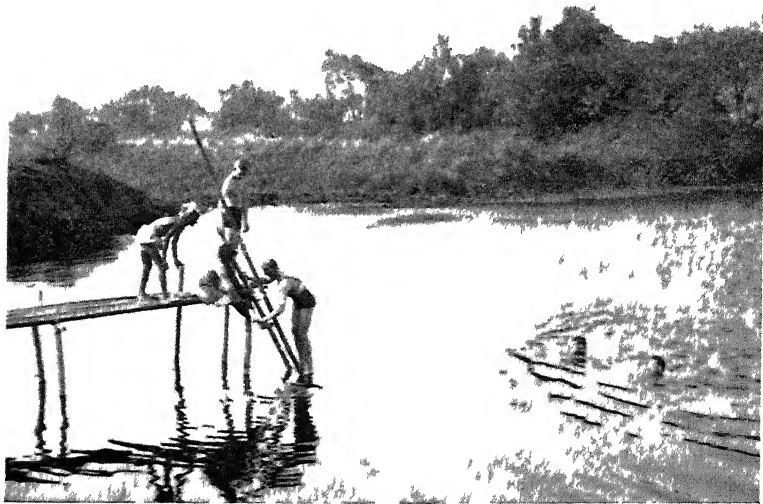
heat of the plains and oppressed by our heavy flying suits, it was possible to climb out of the machines, strip off our cumbrous equipment and plunge straight into the cool depths of our still, brown pool.

There were no elephants to share this swimming bath and Came assured us that we need fear no other intruders. He backed his opinion by taking the first header into it when it was ready for use. The pool formed part of a river which ran into the River Panar only during the rainy season. Above and below it was the bed of the river, covered at this time of the year with the rank growth of trailing plants and creepers. It was screened from the aerodrome by a bank in which steps were cut for our convenience. The pool at first sight was quite uninviting. It was completely covered with weeds. Came suggested having it cleared and next day he had a party of fishermen on the job. Their method was to enter the water armed with sickles, take a deep breath, dive down, hack off the weeds and return to the surface with an armful. These men were excellent workers and soon had the greater part of the pool cleared for our benefit. On the bank near the aerodrome we built a diving platform of bamboo poles with grass and matting for its runway and alongside it was set a bamboo ladder to enable the bathers to climb up the 6 ft. from the surface of the water.

The pool immediately produced amusement and mischief, as well as refreshment. Someone discovered that the aircraftmen were not using the rubber pneumatic beds which had been provided for camping out and two of these were inflated and launched as adjuncts to the bathing parties. Once the trick of climbing out of the water on to a bed had been learned, the swimmer had a raft which he might paddle about in the sunshine until somebody disputed his right to it. Came returned from a voyage of exploration one afternoon



Cleopatra had her secluded bathing pool in the centre
of this rock at Mersa Matruh



We had to make our swimming pool in less seclusion
in a pond in a dry river bed bordering the landing
ground at Lalbalu

with three turtle's eggs which he had found among weeds at the far side. He unwisely handed them up for inspection to M'Intyre on the diving stage and then, realizing his disadvantage, took to the water for cover. M'Intyre began to look for victims. The doctor, who was dressing on the bank, was invited to catch the first egg. Suspecting nothing, he did so and then, to use M'Intyre's words, "retired, smelling like a glue factory to wash the stuff off his hands and arms." Came was the next. He guessed what was coming and tried to evade it by diving, but he made a good mark as he came up and the second egg broke in a dirty yellow splash on his bald head.

The third was reserved for a more elaborate joke on Shepherd who had been sunning himself in the middle of the pool, conscious only that jokes of some sort were being played on the bank but ignorant of their nature. He was now persuaded to paddle his air bed up to the diving stage so that a photograph might be taken. M'Intyre, camera in one hand and egg concealed in the other, manoeuvred him carefully into position and then dropped the missile. The egg struck his brow with a soft squelching sound and spread its contents abroad; at the same moment M'Intyre's camera clicked, just before Shepherd slid cursing off the bed to wash away the stinking traces of the indignity in the water. That photograph is one of the best in M'Intyre's "rogues' gallery" of the expedition. He succeeded sooner or later in catching us all in some undignified state. He even caught one stately member of the party asleep with mouth wide open, one afternoon and after surrounding him with empty beer bottles took his photograph. That gallery of curiosities would have served as a splendid corrective if any of our number had developed "swelled head."

M'Intyre declared, perhaps without much real justification,

that three of his friends were less well-disposed to him after that, until the crocodile scare reunited the bathing party in a common interest. Our suspicions had been aroused for two or three days because we noticed occasionally what looked like a small piece of old wood drifting on the surface in the middle of the pool. The suspicions seemed groundless when the "wood" took no notice of clods of earth which were thrown at it and we went on with our bathing, though taking care not to approach the bit of flotsam.

At last doubt was resolved into certainty when one of the aircraftmen found a 7 ft. crocodile basking in the sunshine on the bank in the quiet hour immediately after lunch. That seemed to mean the end of bathing. The Air Commodore certainly thought so and issued orders accordingly. The aircraftmen, camped within 50 yards of the brute's home, were magnificently unconcerned about the risk of a night visit from him, but the Air Commodore decided they must have rifles and ammunition in case of emergencies and as we could no longer swim, three of our number formed themselves into an early morning patrol to stalk the dweller in the pool.

For the next few days, Ellison was a worse disturber of the bungalow's slumbers than he had already been. He had his party, consisting of M'Intyre and Shepherd, out of bed before dawn to drive away, armed like bandits, to the pool. There they lay on macintoshes in the wet grass at equal distances round the edge of the pool, waiting for the crocodile to come up to breathe or, better to suit their purpose, to lie still on the surface while the dentist bird picked his teeth. On a few occasions Clydesdale joined the shoot. There was no doubt about the presence of the brute or about the attentive presence of the little dentist bird whenever the snub nose showed itself. The bird fluttered across and across, just above

the surface and though we never saw it performing the duties which legend ascribes to it, there could be no doubt of its particular interest in the brute that absorbed our attention.

The time at our disposal for ridding the pool of its menace was very limited, and on the first three mornings the watchers never saw more than the nose, sufficient to identify the thing as the flesh-eating crocodile and not the comparatively innocuous fish-eating alligator. It was no use to shoot at the nose, or at any part except the softer part of the shell just behind where its ears would have been if it had any. A bullet in the spine would mean death; a bullet anywhere else would mean a wounded and angry crocodile still at large in our pool. The hope that we might get a shot at him out of the water was not to be realized and the local people, taking a kindly interest in our efforts, began to make helpful suggestions.

One of them explained the method of baiting a huge hook with toasted kite-hawk, lent us the appropriate tackle and, when we objected to shooting kites which are protected by law in India, volunteered to supply us with the necessary bait. The vermin-infested corpses he delivered at the bungalow next day were a nuisance to several members of the party before they were singed and impaled and hung temptingly over the surface of the pool for the undoing of our enemy. The most villainous use to which they were put badly annoyed the doctor. Ellison had exhausted most of the routine jokes to disturb the doctor's afternoon siesta and now tried the power of the dead kites to rouse the sleeper, a measure which our long-suffering doctor resented strongly as unhygienic if not positively dangerous to health.

That evening the double hook was baited and set. It was attached by a many-stranded steel cable to 50 yards of stout rope which in turn was secured to a tree. Then with the aid

of a forked prop it was arranged so that it dangled out over the water. We expected next morning to find the bait taken and the "mugger" waiting at the bottom to be hauled out by the united man-power of the party. Nothing of the sort happened and the rifle pickets resumed their stations.

At last the chance of a shot came one morning when M'Intyre, Shepherd and Ellison were at their posts. It was a long shot at a target in the middle of the pool and there was certainly a hit but as Sergeant Greenwood had another shot at an object in the pool later that day, we were never sure who was entitled to claim the kill. That sunny morning the crocodile came more confidently to the surface. The nose as it broke the water was slowly followed by a pair of small, glassy eyes. Within a quarter of an hour, an inch or two of the ridged back was visible.

The watchers lay motionless for the great body to swing broadside on to one of them and so present the neck mark. Actually the neck did not come above the surface of the water, but when M'Intyre found himself well placed, he took leisurely aim at the spot in the water where he judged the neck to be. The others loosed off their rifles immediately afterwards, and in a great swirl of discoloured water the beast dived to the bottom. Two days later its body floated to the surface. It was recovered and the skin was taken from the under part by the aircraftmen. The rest of the carcase, except the hard outer shell, was quickly removed by the vultures, but the skeleton remained on the bank, a memorial of our surprise, until we left for home.

This visitor must have marched across country from the River Penar at night. We could not be sure that others would not follow his example and another crocodile was surprised in the shallows of the pool one day. Therefore, we resumed our bathing only under special safeguards. The rule

thereafter was that a couple of fishermen should watch the pool all day from the bank and, while we were bathing, should take station at the top of two of the bamboo poles stuck into the mud of the pool about 10 yards from the bank and about 10 yards apart.

The fishermen were delighted with their job, for they slept when we were not there to compel them to watch and, in addition to their daily pay, were often rewarded with an English cigarette when they finished their pole-squatting duties. The non-swimming members of the mess teased the rest about sending these two natives into the pool ahead of us. It is true that they had to go in, swim the 10 yards to their poles and climb up them before we plunged in, but the arrangement was voluntary and the fishermen had in theory watched the pool for hours before. We were satisfied that they regarded the job as easy money.

So much excitement for the sake of our bathing arrangements may be thought disproportionate. Our major jobs went on at the same time and crocodiles were only an extra interest. Those who have visited India for short periods will appreciate the surprise with which our party discovered the need to take precautions against animals and reptiles. We knew before reaching Purnea that all the fauna of India might be found in the district. We met people who had shot tigers in the neighbourhood and heard tales about snake-bites. Those who had time to spare were urged to join in crocodile shoots. It was learned that the great landowners of the district still kept the elephants acquired in the first instance for tiger shooting.

To be told these things is to be comparatively little impressed by them. They take place in one's mind alongside the stories of native magic and superstition as traditional features in the character of the land. To meet one's first

size of those jaws, Shepherd was a warm supporter of the Air Commodore in his prohibition of bathing until the crocodile had been shot.

This closer acquaintance with the animal dangers of the land made no difference to our mode of life at the bungalow. We still slept on the veranda or with all the bedroom doors open. Yet it may have revived in some minds the stories of days when Purnea had been in the heart of shikari country. One member of the party gave himself a shock on a dark night when he found sleep impossible because of the incessant barking of a native watch-dog at the rear of the bungalow. Crawling out from beneath his mosquito net, he took an electric torch and went out to the back porch. The beam of light soon revealed the dog, chained to an outbuilding and barking furiously towards the farther darkness. Suddenly the watcher became conscious of a dozen points of light in that darkness—the light of his torch reflecting in a dozen eyes—and for a few moments his mind suggested tigers, wolves, hyenas, until at last he jumped to the truth. It was a pack of jackals, trying to carry off the dog's bones. Gathering up a handful of small stones, he flung them among the intruders and scattered them so that both he and the disturbed dog could go quietly to sleep.

A more amusing encounter occurred one morning outside the bungalow. Our visitor was a baby elephant with its mother. The baby seemed to distrust some of us, though we offered it such delicacies as we had, and Maconnochie, the assistant film director, was neatly bowled over when the little rascal suddenly charged him. He then looked round for another ninepin and his mischievous eye rested on Clydesdale, so that it seemed desirable to beat a retreat. M'Intyre afterwards wrote a highly coloured version of the affair. Though

the chief actor in the comedy is unable to vouch for the accuracy of its details, he offers no objection to the reproduction of that account. M'Intyre wrote as follows:—

“As we sat discussing plans outside the bungalow we noticed an enormous elephant with a mahout perched between its ears, followed by a tiny baby elephant crossing the maidan. We hailed the mahout and invited him to bring his caravan over for our closer inspection. The little chap was most attractive with ridiculous little baby hairs all down his trunk and as playful as a kitten for all his ton of weight. We became sportive and gambolled with baby, and found that by pushing his face in he could be persuaded to afford wonderful sport by offering chase. After about half-an-hour's fun and games he began to lose his temper.

“The mahout climbed down to put a stop to this nonsense and received a well-timed prod in the chest which sent him over in a beautiful backward somersault to a precision landing on his neck. No sooner had he picked himself up than our chief pilot appeared on the scene and in all innocence approached to pet it in the friendliest manner. Baby gave him one dirty look and shot at him like a rocket. My commanding officer disappeared round the corner of the bungalow at a modest 15 miles an hour followed by Baby at a most immodest 14.9, but improving.

“Meantime, the stage was set most beautifully for the onlookers. The outline of the bungalow made a useful rectangular track and as there was a through room in the centre the spectators could, if they were nippy, see both pieces of the straight by dashing through the central room to the other side of the bungalow. Applying this method, we usually arrived at the front or back in time to see the cloud of dust go by with peculiar pounding and snorting noises.

“If one arrived there early, one obtained a splendid view

of them rounding the first bend with the chief pilot fairly clear in front of the dust cloud; a little late and there was only the cloud to be seen with tail end of elephant showing dimly through the haze. The race finished amid great excitement when the quarry blazed a new track through the grandstand. Baby, seeing humans screaming off in every direction, became a trifle confused, hesitated, decided not to trust his weight on the bungalow floors and retired very ruffled from the race. Our conference could not be resumed until the chief pilot had returned, hot and dusty, from a distant mango grove."

Fortunately, we were not visited by baby elephants often and soon slipped into the sort of routine which ensured that the expedition should be ready to get away at an hour's notice on the big flight. The pilot and observer allotted to each machine made themselves responsible for the material they would have to use and superintended any work which had to be done to keep it in order. The wide difference between day and night temperatures, for instance, made it desirable to keep a close watch on the rigging of the aeroplanes. The difference was sometimes as much as 20 deg. The dry heat of the day had its effect on the big airscrews fitted on the Pegasus engines. This effect may have been aggravated by the need to have aeroplanes out in the sunshine, occasionally for an hour or more, in order that Barkas might stage some of his scenes. At all events, the wooden airscrews seemed to shrink every few days and the bolts securing them to the bosses needed frequent tightening. The delicate pieces of mechanism had to be protected from the dust which stirred and penetrated at every rise in the wind. The oxygen nipples were covered with pieces of cloth. The cameras were wrapped up, but this proved insufficient and they were eventually taken to pieces after every use; the parts were wrapped in paper

and put away in the boxes in which they had travelled from England. And then, for safety's sake, they were taken back to the bungalow and locked up. In these circumstances a full hour was needed to fit the cameras into the aircraft.

The actual routine of a particular day was determined usually by the weather. Every evening the Indian meteorological service sent us by wire from Calcutta a forecast of the next day's weather in the neighbourhood of Everest, and Mr. Gupta, the meteorological officer sent specially to Purnea for the period of our stay, called in to discuss it and to supplement it by his own deductions. If it offered any chance of a start the following morning, the Air Commodore was away by dawn in the Puss Moth to check by visual means the state of the weather over the mountains, taking with him Mrs. Fellowes, Shepherd or one of the film men unless he had special reasons for wanting to reach the greatest altitude of which his scouting machine was capable. While he was away, Mr. Gupta and his assistants were putting up balloons and recording the wind strength at various heights until the balloons passed out of the range of the telescope.

If the prospects seemed at all promising, the rest of the party was busy preparing gear for the trip, the pilots making final calculations in view of the forecast strength and direction of the wind and deciding the course to be laid and the rate of climb to be maintained, while the observers put cameras together, polished lenses, loaded film and plates. The tasks occupied perhaps an hour and a half, during which time the sun came up out of the mists and the light began to have the quality necessary for good photography.

Often we stood to, ready to start the engines when the Air Commodore returned to the aerodrome, only to be told that though the wind strength was reasonable, there were heaps of piled cloud on the mountains; or that a clear dawn was

changing into a cloudy morning as the sun warmed the drifting vapours over the plains and encouraged these currents to condense as they reached the ice-fields; or that a fine, clear day was being ruined by high winds over the mountain-tops, as might be gathered from the length of Everest's plume, streaming away sometimes six or seven miles to the leeward. Some days this procedure was unnecessary for the hurricane winds, which came sweeping across the flat lands, told their own tale and kept us busy weighting down and repairing the tents.

The hangar tents had seen a lot of service and were hardly fit to weather gales. In the 60-miles-an-hour winds which tore at them for three days and nights in succession, their roofs were split and rent and the pegs holding the side curtains were dragged out of the ground. With the aircraftmen we laboured to preserve the aeroplanes from damage. Dozens of sacks were procured, filled with sand and made to do duty in the place of pegs. The biggest pickets were got out and the machines were tethered to the earth at every possible point. Ladders were obtained and the aircraftmen began to lace together the torn flaps of the roofs—a craft which was quickly learned and taken over by Came's native labourers, adaptable fellows who worked very well when once they understood the nature and ways of the job. They were at work on those roofs every few days as long as we remained in Purnea.

While the gale lasted, a special night guard was kept at the aerodrome, under the orders of one or other of the pilots. The R.A.F. men had a certain amount of trouble with their sleeping tents, but this was due more to the rain and thunderstorms which accompanied the gale than to the wind. Some of the tents became flooded and wet clothing had to be taken to the bungalow to dry. Otherwise, the men's standard of

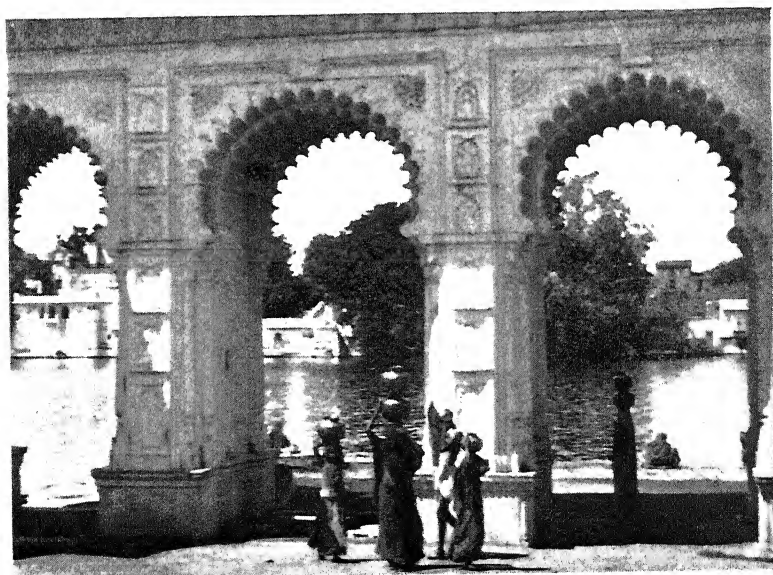
comfort was fairly high—how high we did not realize until we took our turns at night duty on the aerodrome. They had fitted up the little 1½ h.p. single-cylinder petrol engine we had taken out with us, harnessed it to a spare generator and so provided themselves with an electricity supply. They had run wires into their dining and recreation tents, obtained the necessary fittings and bulbs; and while we made shift with oil lamps at the bungalow and the club, they dined and read and played games every night by electric light as good as that which they had left behind at Karachi.

We smiled a little ruefully at our own lack of enterprise and congratulated the men on their foresight. One of our number had special reason to be glad that the aircraftmen were comfortable in their camp. Shepherd was responsible to *The Times* for keeping competitive newspapers from gathering information of the expedition's doings and had been worried at reports that journalists who had followed us to our base were cultivating the aircraftmen and inviting them out to evening parties. As far as we knew, there were never any leakages of information through that source but, as Shepherd said, it was good to know that the men were more comfortable in their own camp o' nights than they could be in any of the bungalows to which they were invited.

On days when there was no gale to keep us anxious or busy, unfavourable reconnaissance reports spelled opportunity to the film men and, if memory may be trusted, Barkas never failed to take one of these chances. His programme was completely mapped out in advance and he was therefore never at a loss for suggestions. His job apparently was not just to record the things that were done by the expedition but to build up a story consisting partly of scenes set for the express purpose of being filmed. The technical term of his programme seemed to be the "continuity."



Tiger and pig fight in the private arena of the Maharajah
of Udaipur



Udaipur reputed to be the most beautiful city in the
world

There were always gaps in it which he was anxious to fill. He wanted his local colour—natives at the local market, looking up open-mouthed at the aeroplanes as they passed overhead; elephants in their gayest trappings passing by the big machines; the bow-and-arrow men of a neighbouring village paying a visit to the aerodrome. We had to fly the aeroplane for him when the market was at its busiest, be in attendance when elephants or aborigines arrived and take part in welcoming local potentates while the film cameras whirled and the sound apparatus recorded our self-conscious remarks. There were other scenes to be set. We had to take off and land over the heads of cameramen, climb in and out of the aeroplanes in our hot suits, hold conferences and receive reports, speak prescribed dialogue and go through the motions which film custom had ordained for the sort of circumstances in which we found ourselves. We were poor actors and scenes had to be shot over and over again, so that early morning often became high noon before it was possible to win our release.

This sort of delay brought extra troubles to the film men. The heat of the day might cause the film to buckle and to jam as it ran over the guides to the lens and then there would be a halt while the apparatus was readjusted. The scene would be started afresh and again the heat would defeat it. One morning there were three such interruptions before Barkas decided to abandon the attempt for the day. On subsequent occasions a native was on duty with a huge umbrella to give shade to the troublesome camera and still the film jammed on occasions. But Barkas had other ideas too. He wanted shots of mountain scenery to supplement those which could be taken on the way to and from Everest. We sent one of the machines for that purpose to the lower

slopes of Kangchenjunga, a trip which involved no trespass over Nepalese territory.

He then conceived the idea of suspending a cinema camera under the wing of one of the machines so that a shot might be made, clear of struts and bracing wires, as we approached the mountains. Our mechanics undertook the job and arranged a cable so that the operator in the cockpit might switch this outboard camera on and off at the required periods. Finally, he had an inspiration, which got us into trouble with the local populace and gained us an ill reputation which we never quite lived down. For the purpose of the continuity, he conceived it to be desirable that some visual signal should mark the climax of our flight to Everest and announce that we were turning for home. Barkas suggested that this should be achieved by releasing from Clydesdale's machine a smoke-bomb which Bonnett in the other machine would be able to photograph as the signal of triumph and completion.

That suggestion Clydesdale opposed on several grounds. It seemed to him an objectionable piece of theatricality to introduce into a serious task. It would also add to his duties at a time when he should be concentrated on flying and navigation. It would lead M'Intyre to try to keep close to him at a height where slight miscalculation might mean an accident. And, finally, he was not at all certain that there would be sufficient smoke in the thin air at 35,000 ft. to photograph. The opposition was not very well received. The expedition had made a contract with the film firm and several members of the expedition looked favourably on the suggestion, the point being apparently that a large fee had been paid for the film rights and that we ought consequently to try to deliver such goods as the film company desired.

The ingenuity of the party was again brought to bear on the problem. Telegrams inquiring for stannic chloride were

sent to Calcutta and eventually brought an offer. The smallest quantity we could buy was about 100 times more than we needed: it was bought and two days later it arrived. In the interval, a small treacle tin had been made into an adjustable stannic container. It was arranged so that it could swivel about two supporting arms which gripped it just below the middle of its girth. Set in this way it could be trusted to turn upside down and spill its contents the moment the restraining clip which secured the lid was withdrawn. This neat contraption was placed under the lower wing with a string, for the withdrawal of the clip carried into the cockpit. The intention was that at the climax of the flight the tin should be allowed to swing over, that the weight of the stannic chloride would then push open the lid and that the stannic meeting the air would produce a smoke cloud.

The thing was never tried over Everest because Clydesdale forgot all about it. That left another gap in the film continuity and Barkas suggested making the shot at a height of 3,000 or 4,000 ft. near the aerodrome. Away went both Westland machines one bright afternoon to perform the necessary illusion. M'Intyre, with Bonnett in "the office," was to fly behind and a little below Clydesdale's machine so that a picture of the smoke signal should be made against a clear sky, showing nothing of the landscape over which it was released. The presumption was that this length of film could be spliced into the record of the big flight at the appropriate place and so signal the climax or the conquest or whatever the caption-writer might decide was the popular description of the moment when we turned for home.

The treacle tin worked perfectly. The stannic was duly spilled and left a fine trail of smoke as it broke up into drops and streamed downwards. Bonnett's camera whirled merrily as it fell, and there can be no doubt that the desired smoke

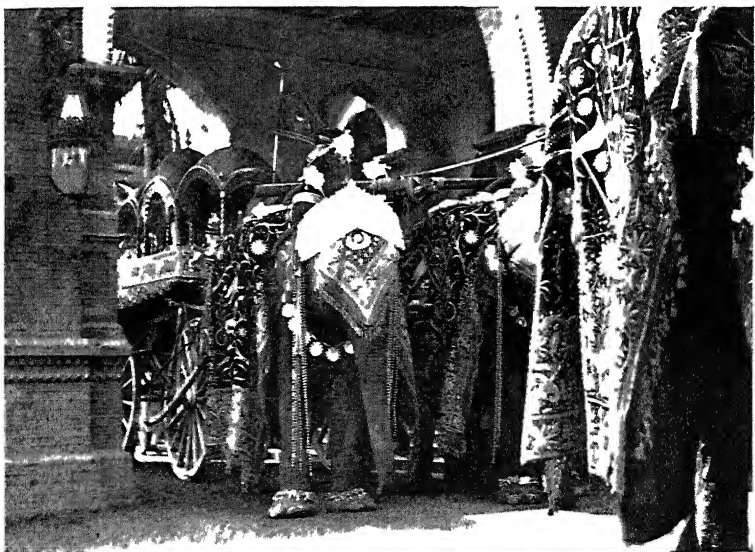
signal, produced at some trouble and expense, was duly recorded on the film. What happened to that strip of film we never knew. It did not find its way into the picture which was released for public exhibition, and we never had the energy to grumble at the film company over the many things it demanded of us and never used; but that afternoon's work started a rare scare among natives in the district.

The smoke bomb had been seen by thousands of natives all over the neighbourhood and it confirmed the suspicions they had harboured ever since our arrival. Few of the natives believed when we first reached Purnea, that we had come only to fly over Mount Everest. They suspected some more sinister purpose and anti-British agitators suggested that our real object was to fly over the Himalayas and across Turkestan to give air assistance to one or other of the warring factions in China. Ignorance of geography and of the powers of aircraft permitted wide acceptance of this grotesque idea. The smoke bomb satisfied the native mind of the warlike nature of our real intentions.

The rumour spread rapidly through the district that we had begun bombing practice, that we were going to clear a wide area near the aerodrome and that all who lived within three miles of it must leave their homes and migrate to more remote settlements. Natives from the villages around Lalbalu began to trek into Purnea to seek instructions and advice from Mr. Sherma, the Magistrate, and from Mr. C. J. Creed, the district police officer. The disquiet lasted several days and during that time we drove a little faster than usual through the villages on our way to and from the aerodrome. It was an additional misfortune that one of the motor-cars ran over a kid which scampered across the road in front of it about this time. Although the owner was compensated, the incident



Indian hospitality The Maharajah of Darbhanga formed a procession to conduct members of the Expedition round his estates



One of the vehicles of silver and gold, carved ivory and studded with precious stones drawn by a four-in-hand of elephants

OUR BASE CAMP AT PURNEA

strengthened the popular belief that our presence boded ill for the native population.

The only thing which seemed to restore us to comparative favour with the Indian population was the race meeting arranged for us on Easter Monday by the Rajah Banaili. All the natives turned up for that and had the pleasure of watching us try to handle the hard-mouthed local ponies and of seeing aircraftmen, who had never bestridden a horse, being unseated as the ponies galloped round the course. By that time the Indians had been partly reassured on the subject of bombing and had learned that we were under orders to return to England. In those circumstances they were ready to enjoy any sport there might be and as we later played a football match against the Purnea team, who beat us in their bare feet, it may be assumed that we undid the harm of our smoke bomb before we left.

But in the week that followed the stannic demonstration several of us very much regretted not having stood firm against that particular demand of the film-makers. Curiously enough, the natives ran a much greater risk in attending our race meeting than they did from anything we did with the aeroplanes. There were a couple of runaways which might have charged the crowd. There was a collision at the end of one race in which Etherton was thrown. One queer animal brought in from some remote plantation, tried to back through the rails into the enclosure and in the race in which Shepherd was leading up to the last bend, his mount refused to turn into the straight but made for the mass of Indians on the other side of the rails. Shepherd had to pull him to avoid an accident and before he could get into his stride again, Clydesdale had gone ahead with just enough lead to win.

The distrust and suspicion of the natives were more easily understood by us at the end of our visit. By then we had

realized the isolation of the district, served though it is by road and rail. During the month we were there, most of us took only one journey—on our visit to Darbhanga, at the pressing invitation of our host, the Maharajah, and we could not have spared the time for that had provision not been made for air transport. The same journey by rail took more than a day. Every time our friend the District Engineer came out from Bhagalpur to look after us, he spent some 10 hours in the train. Calcutta was 250 miles away and might be reached in about 12 hours. Road transport in the direction of Darbhanga was difficult on account of the many streams which flow down to the Ganges and the scarcity of bridges. Going north there were only two or three small settlements between Purnea and the Nepal border; and in Nepal visitors are not encouraged. Had the native in the Purnea district been disposed to make contact with the more highly developed settlements, his remote situation would have tended to prevent him. When we began doing extraordinary things, they were readily and naturally misinterpreted.

In the physical sense we were largely cut off from familiar things during our stay at Purnea. M'Intyre flew once to Calcutta with the survey films of our first flight to Everest and waited there while they were developed. Both he and Ellison flew to Bhagalpur to bring over the Governor of the Province (Sir James Sifton) and the District Commissioner (Mr. John Dain) and once to take Came back on urgent duty. Clydesdale made one journey to Dinajpur to bring help to the Air Commodore when he failed to make Lalbalu after his flight over Kangchenjunga. Apart from such trips we spent very little time away from our base. We were consequently always glad to see visitors and to keep them when we could for dinner in the mess and long talks afterwards on the veranda. One who spent an evening with us was an old

friend of Clydesdale, Dr. Graham, a former moderator of the Church of Scotland and the founder of that admirable school at Kalimpong for half-caste children. At his special request Clydesdale afterwards flew his Moth over the school. There was no chance of landing, but as the children had never seen an aeroplane, he agreed to fly over and deliver a packet of leaflets by dropping them into the grounds. Dr. Graham spoke later of the sensation that visit caused. Some of the children thought they had seen a god.

Mr. Dain, who had helped most willingly to prepare for our arrival, was another welcome visitor. The wireless expert of the climbing expedition came from Darjeeling to spend a night with us and through him we renewed our promise to deliver early copies of any photographs we might take which seemed likely to be of use to the climbers. While Mr. Gupta, the meteorologist, was recovering from the injuries he received in the explosion of one of his hydrogen balloons, we were glad to receive one of his senior colleagues, a charming and able man, full of weather lore and able to settle many of our doubts. Besides these who came many miles to see us, many of the local people were invited to our evening meal. We should have been glad to entertain some of the native gentry in the same way but these were prevented as Hindus, by the rules of their religion, from eating with men of another faith. We soon ceased to find it strange that they should sit and talk to us while we took our afternoon tea.

To the Rajah Banaili we were particularly indebted and would have been glad to find some means of returning his hospitality. The best we could do was to fly the smaller machines out to his estate on the afternoon when he entertained the whole party to tea, and give an aerobatic display over the house, for the benefit of his guests and his household.

The presence of Mrs. Fellowes in the party also enabled us to arrange for a purdah visit of the Ranee to the aerodrome.

There were naturally a few uninvited visitors. Journalists commissioned by news agencies and by London newspapers, took up their residences in or near Purnea and began to make their appearance at the aerodrome to the intense irritation of Shepherd who feared that the elaborate arrangements he had made for preventing the leakage of unauthorized information, would break down if such people were allowed access to unsuspecting mechanics and aircraftmen. It was difficult to have them excluded, for there was, on most days, a small party of interested Europeans at the aerodrome and we could hardly expect the native police to distinguish between legitimate visitors and interloping pressmen.

We have often recalled with amusement the violent indignation of Shepherd at the outcome of one forthright demand he made to the Air Commodore. One newspaper representative boldly paid his visits armed with a camera and Shepherd at last appealed to the Air Commodore to forbid him to enter the aerodrome. The Air Commodore agreed to deal with the man and had a talk with him. The upshot was that the Air Commodore afterwards informed Shepherd that the man had given his word of honour that he would make no journalistic use of anything he saw or heard on the aerodrome. From the almost incoherent wrath with which Shepherd received this assurance, it was to be concluded that he had a poor opinion of the honour of some of his professional brethren.

Another visitor, who presumably failed to find our flying field, came in a Moth belonging to the Bengal Flying Club and damaged it in making a forced landing in the plain through which the Kosi wanders. The damaged Moth was reported after one of the early morning reconnaissances and

Clydesdale went out the eight or nine miles to see if help was needed. He formed the opinion that a longeron had been broken and we had no material for that sort of replacement. Later, an instructor arrived from Calcutta in another machine, temporary repairs were done and the damaged Moth was flown (safely we understood) back to the Club.

Actually our visitors were few and it is a curious fact that by far the biggest influx of them came in the part, not of guests but of hosts. The planters of the district insisted on being the first to celebrate our flight over the great mountain. For ourselves there was no question of celebrating that flight of 3rd April. To us the work was only half done. The survey cameras had not yielded what was sought and until we had put that right on a second flight, there could be no plans on our part for slackening off. But the kindly people of the neighbourhood would not be put off. The first flight was a matter of prime interest to them. They felt they had been associated with it and they wanted to offer their congratulations in an appropriate setting. So there had to be a dinner in the Club and it had to be on a Saturday night, so that people could come in from the countryside and take their leisurely way home again on the Sunday.

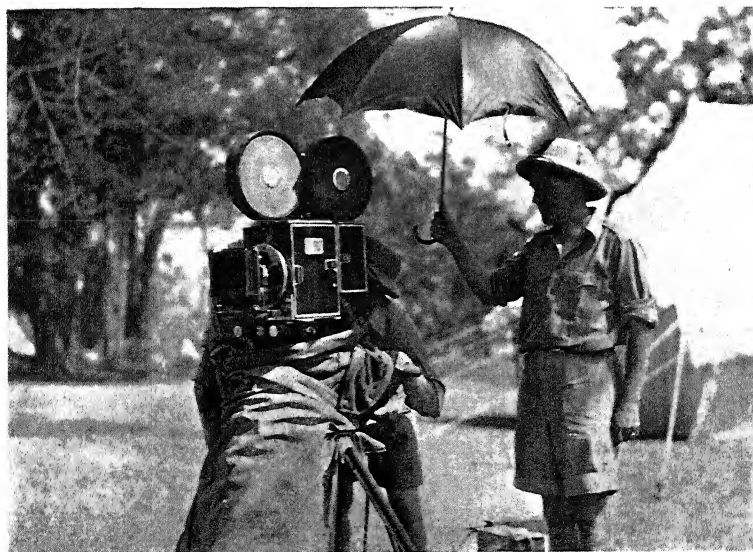
The way the planters came in from the more distant estates, 40 or 50 miles away, to cheer our little party was very gratifying and might have been a little embarrassing if it had not been clear from the start that this was to be a jolly friendly affair and no more formal than it must be to make a good excuse for their jaunt. Tom Smith, for instance, spent the week before the dinner making wooden horses for the game of parlour polo that it was decided should be played after dinner between Purnea and the expedition. Most of the planters booked seats for wives and daughters, and stipulated that there should be dancing. The few loquacious ones were

warned that there must be no long speeches. When the time came, the Air Commodore and Clydesdale were unable to escape speeches of thanks and acknowledgment, but they certainly did their bit towards brevity. It may be doubted if so many people had ever before sat down together for dinner in that barn-like clubhouse. How the cooking and serving were done we never understood. We knew vaguely that the cooks and house-servants of the community had been mobilized for the event and we concluded that the management and organization of them was one of the miracles of Mrs. Tom Smith. There we had to leave our speculations and thank our charming hosts for a very good and merry meal.

It was more like a Christmas party than a formal celebration. Tom Smith was as good as his word. When the dinner was over he produced enough wooden horses for two polo teams, had the room cleared of tables, swept the ladies away to one end and ordered us to get our team mounted. The scheme was to sit astride the toy horses—a grotesque enough business for the long-legged ones like M'Intyre and Shepherd—and to propel them after the ball, using the right hand instead of a polo mallet to make strokes. The horses, of course, began soon to lose wheels and then to collapse. Chukkers began to resemble rugger scrimmages and neat black evening clothes became smudged with chalk which had been rubbed into the boards in readiness for dancing. It was a slightly dishevelled party which came afterwards to invite the ladies to dance, but Tom Smith's boyish high spirits had evidently been the right thing to loosen up the party and give it the proper air. No party ever went with a better swing or needed less excuse ultimately to justify it. It pleased everybody because it was full of good humour; and it suited us because it did not pretend to magnify our achievement into



The natives never lost their awe of the aircraft



Fisher attempting to keep his camera cool

something it could not justly claim to be. The next day we all got back to our jobs, refreshed but far from deluded as to what still remained to be done.

We had to wait until the very end of our stay for a chance to return this and a great deal of other hospitality. It was useless to think of parties of our own until the second flight had been made and the main object of the expedition accomplished. Almost on the eve of our departure for home, we gave a garden party in the grounds of the bungalow and once more local society assembled, this time to drink tea with us and to see something of what had been done. By this time our negatives had been developed and prints made. We spread out the proofs before our visitors. Some of them were hardly dry. It was pleasant to be able to make these people who had treated us so well, our first audience and we all had the feeling that they were gratified at being the first to see what had been brought back from the crest of Everest.

We constituted ourselves guides and lecturers, explaining even the vertical photographs which were arranged in the usual overlapping way so that they became mosaics of the mountain territory over which we passed on that second flight. Nor in this last gesture was the native population to whom we had been something of an anxiety forgotten. Just before sunset Ellison took up the Moth and performed all the aerobatics of which it is capable. He did his neat work so low that some of our lady guests were genuinely disturbed. All the natives came to see and were hugely delighted.

As we received few visitors, so we made few visits. Knowing full well that the vital hours of suitable weather must be snatched whenever they should arrive, we could not trust ourselves to be long away from our base. When a journey could not be avoided, one or other made it as quickly as possible. Ellison had to detach one of his motor vehicles for a day to

take dope to Forbesganj, the forward landing ground 60 miles to the north and have the fuel ready mixed there lest we should have to start from there or call there on our way back for petrol to get us home. The doctor too, spent a day away on a crocodile shoot. The rest of us stayed close to the base and occupied ourselves with keeping aeroplanes, engines and gear ready for a start at the shortest notice. One journey which kept us abroad for a night and two days was made gladly enough because it enabled us to meet and thank the Maharajah of Darbhanga. He had lent us a house to live in and done a hundred kindnesses but, so far, none but Etherton had met him. We would have flown him the 100 miles to Purnea with pleasure, but the thought of his flying was distressing to his mother and so he suggested that we should all visit him at his palace. That visit introduced us to the princely ways of the old India.

There was no landing ground at Darbhanga. For our benefit one was made. A piece of flat land which was split up into paddy fields one day was rolled and prepared for our landings the next and two days later was divided up again into fields and restored to cultivation. In our honour, the Maharajah's 40 elephants were turned out and harnessed to carriages of state or loaded with stately howdahs and we were paraded through the estate to the palace. A lavish banquet was spread for us and magnificent gold plate brought into use for its service.

The special bodyguard of this prince was turned out for our inspection and a native band, in resplendent uniforms, was mounted on the leading elephant. The Durbar chamber at the palace was arrayed in full panoply of ornament and coloured lights and there we danced a little after the banquet. The elephant transport was novel to most of us and rather disturbing to some. It was amusing to make one's way up

to the howdah by way of the elephant's haunches, mounting first on to the heels of its hind feet as it knelt, then seizing the tail and hauling oneself up on to its broad hindquarters. There was some disturbance when one howdah was seen to be slipping and Etherton, one of the passengers, was still less pleased when at the end of the journey he learned that that very bull elephant occasionally went "must" for a month or six weeks at a time.

This visit gave us an idea which we should almost certainly have carried into effect had we not been compelled by the trend of events to make our second flight to Everest secretly and hurriedly. Darbhanga was 100 miles west of Purnea and when we saw the landing ground the Maharajah had made for us, the thought immediately occurred to us that we might start our next flight from there and so avoid part of the struggle against the strong west wind. As long as we were at Purnea there was always a west wind over the mountains. While we climbed it was necessary to use some of our power to counteract the drift which sought to carry us far to the east of our objective. This lengthened the duration of the flight and so caused us to use more oxygen.

The question of oxygen was a vital one on the second flight. We had just enough left for one full flight. If, on reaching high altitude, it was found impossible to make Everest, we should have ruined our chance of another attempt by breaking into the last cylinders of oxygen. It was for this reason that we seized eagerly on the idea of starting from Darbhanga, climbing with the wind on our beam and then coming down-wind over Everest and making Purnea to end the flight. We pilots were soon busy working out courses and calculating times and distances. The plan seemed a good one, and in the end it was a misfortune that we were unable to put it into effect.

By this time we knew how small were the chances of getting really favourable weather. The meteorological service provided locally by Mr. Gupta told us day by day all we needed to know. At dawn every morning he and his assistants were on duty, releasing big hydrogen balloons which he watched through a telescope until they were out of sight. The rate of ascent was known and by measuring the angle of drift, he could arrive at the wind velocities for various heights. On most days he could follow the track of the balloons up to a height of 25,000 ft. and that figure gave us a pretty sound idea of what might be expected above that height. Again in the afternoon Mr. Gupta set up his balloons and it was on such an occasion that one exploded and the hydrogen took fire. There was never any clear explanation of how this happened, but all three men were badly burned. We were sorry to have to do without Mr. Gupta, for he had an almost uncanny weather sense. On the evening of 2nd April, from his own observations and the general forecast supplied by the Calcutta office, he promised us, quite definitely, weather suitable for our flight on the following morning. His prophecy proved to be right, except that neither he nor anybody else knew anything about wind strengths near the summit.

Every evening Mr. Gupta came along to the bungalow to make his own report and to discuss the forecast from headquarters. This forecast was sent daily by telegraph and was of great value to us. The detail it gave us up to a point may best be shown by quoting one of these telegrams. The message which arrived on 4th April, the day after our main flight and the day on which the Air Commodore and Ellison flew over Kangchenjunga, was as follows: "To Everest Expedition, Purnea. Probable weather Purnea—Everest fifth, morning to noon. Western disturbance causing cloudy

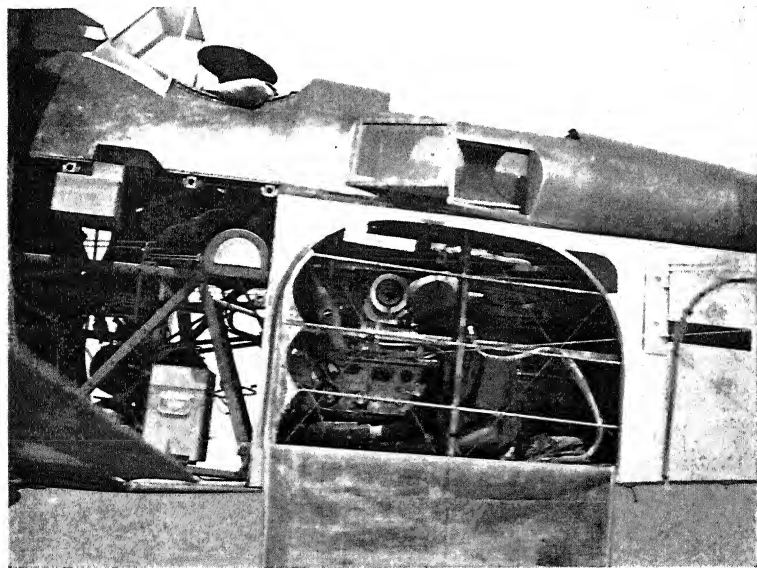


BLACKER

CLYDESDALE

FELLOWES

In Conference



Side view of the Wallace showing oxygen cylinders
under pilot's seat and heating and oxygen controls in
observer's cockpit

weather Everest region. Cloudiness likely extend and increase along route with possibility of snowfall Everest region by to-morrow afternoon. Visibility fair over plains but may be poor near cloud-capped peaks and during snow showers. Upper winds between west and west-north-west. Strength near Purnea likely to be about 40-50 miles per hour all heights above four kilometres. Strength Everest region unknown. Purnea sea-level pressure 29.54 inches." A message on this pattern generally arrived some time after dinner and formed the subject of a conference between leader, pilots and meteorological officer which determined the following day's work subject, of course, to the report brought back after the dawn reconnaissance flight.

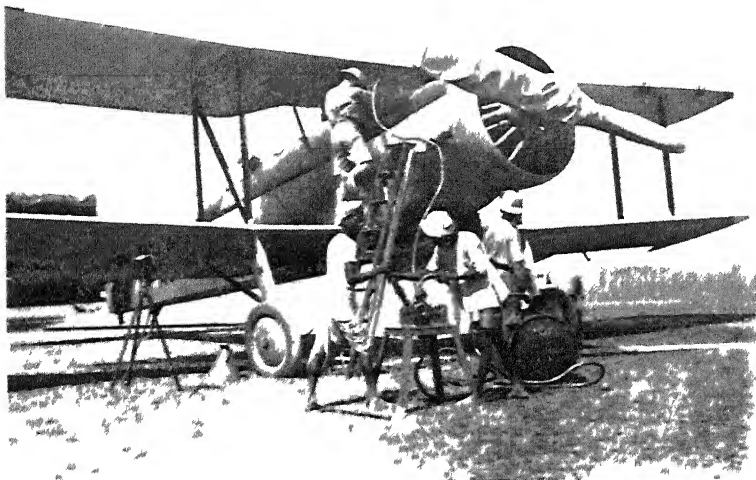
For a whole fortnight after our first flight we waited gloomily for the chance to try again to do the work which our vertical cameras had left undone. During that time we had experience of the violence of tropical storms and knew the full measure of anxiety when fierce winds tore the canvas hangars into strips and torrential rains turned dusty roads into streams of mud and flooded the fields. The brief storm which wrecked the Fox Moth at Allahabad was repeated day after day and we marvelled that our encampment and its valuable equipment were not wrenched off the ground and carried away into the Bay of Bengal.

A group of us stood on the veranda one afternoon while one of the ragged storms advanced on us. In the middle of it was a solid wall of a bright pink colour; around and above it was the leaden thunderstorm, unmistakable the world over. Tom Smith who knew all about Indian storms, pointed to the pink patch with his crop and remarked, "Hail." Within five minutes we saw that he was right. The curtain of hail marched forward out of the pink mass and swept across us, tearing leaves off the trees and cutting down the

flowers in our garden. The hailstones were big by English standards, but it was less their size than their density that impressed us. In ten minutes the curtain had passed on and we watched it withdraw, still as compact as a waterfall though a wind of quite 60 miles an hour accompanied and pursued it. The trees around the bungalow bent dangerously in the gale and everything loose in the garden and around the house was caught up and hurled yards, yet the hail drove downwards in a solid mass as though it were blown out of the mouth of a wind-tunnel.

So much rain and hail in association with such high winds came as something of a surprise to us. But the flooded fields and the swollen rivers convinced us that we had not over-estimated the amount of rain which fell. The floods led to a curious little incident between M'Intyre and a native agriculturist. But for the floods, M'Intyre would never have noticed that the pony concerned was being ill-treated and would not have been tempted to interfere. On his way to the aerodrome his attention was caught by the fact that a pony was down in a flooded field and he wondered why it should choose to stay down in the cold water. When he returned four hours later the poor beast had not moved and he decided to have a look at it. He persuaded Bennett, the doctor who was with him, to accompany him and the two took off their shoes and waded into the field.

They found the pony had broken a leg and could not get up. It was suffering too, from exposure and lack of food. The doctor listened to its lungs and found it had pneumonia. They were immediately agreed that this was cruelty and they set about doing something. By dint of inquiries they found the owner, and the doctor, who had a good knowledge of Hindustani, formulated the complaint. The owner admitted that he knew about the pony but could do nothing for it.



Fueling the Houston West end while awaiting the
return of the reconnaissance machine.



MINTYRE ITHERTON FELLOWS GUPTA CLYDEDALE BLACKER

M'Intyre suggested calling in the vet. and the owner said he could not afford that. Thereupon M'Intyre asked if he might have the beast shot and the owner, unable to understand all the fuss, said he did not mind as long as he was not put to expense over the matter.

M'Intyre decided to take the affair into his own hands. He dug around in the town until he found the native vet., drove him in the car to the flooded field and had him examine the pony. When he too said that nothing could be done, M'Intyre told him to shoot it and soon afterwards the animal was killed. We were a little anxious lest questions of compensation should arise, but the owner, having been consulted, took no further interest in the affair. He did not even trouble to recover the skin or the tail, which might have been useful. The carcass was left where it had fallen and the following day, when we passed it, nothing but the skeleton remained. The vultures had gone in and cleaned up everything. When the floods receded the bones remained white and clean, a monument, as Shepherd said, to one Scotsman's expensive impetuosity.

The vet.'s fee was rs. 4 (about 6s.) and M'Intyre was chaffed for several days about spending 6s. on a meal for the vultures. That side of the matter was a little incongruous because one of our main anxieties when flying in India was the risk of collision with a big bird. When the expedition was over and we were on our way back to Karachi, the mail aeroplane from Delhi had a vulture fly into it. A strut was smashed and Clydesdale took over the mails and flew them on from Jodhpur to Karachi in the machine which had flown over Everest. We were always conscious of the hovering presence of the vultures. No beast could fall and remain fallen for long without attracting their attention. Any carcass would be picked clean before decay might begin.

On our way one morning to the local agent of the Shell Company in Purnea we saw a strange scene in which some 60 vultures were concerned. A cow had died by the roadside and, protected by its status in the Hindu religion, had been left there untouched by its owner to be found simultaneously by the vultures and a black dog about the size of an Irish terrier. Dog and vultures were intent on their meal and the dog was prepared to fight for his. Time after time he launched himself snarling, in a flying leap at the ring of bald-headed birds, which gave way only to close in again and retreat again before the next attack. Until the dog had secured a joint for himself the farce continued. Then as he trotted away with his prize, the ring closed right in on the kill and stones thrown by us made no more impression than stones cast into a deep pool. When we had done our business with the petrol agent and returned along that road, the feast was over, gluttoned vultures were perched heavily on neighbouring trees and only a few stragglers were still busy among the bones. The value of the scavenging in such a climate is the only thought which can moderate the disgust evoked by such an exhibition.

The bad weather which tried our patience and turned optimism into grim resolution, stuck to us. Even our journeys to and from Darbhanga were made in rain and wind and low cloud which drove us down and made us fly low over marshlands and broken country where forced landings would have been dangerous. Throughout these days we hoped for a change and our weather reports came in day after day and were scanned eagerly for the promise of a break—a promise which never came until it was almost too late and then would not have constituted a good enough improvement to justify our making a flight but for the threat of immediate withdrawal which was upon us. The persistence of the storm

period which began on 5th April, may be gathered from the forecast wired to us while we were at Darbhanga on 13th April. We had arranged to have it sent to us there so that we might even abandon the festivities and fly back to Purnea if there should be the slightest prospect of good flying weather.

This message from Calcutta was as follows: "To Everest Expedition, c/o Maharajah Darbhanga, Darbhanga. Probable weather Purnea—Everest fourteenth morning to noon. Storm conditions continue very disturbed along route with thunderstorm rain over plains and probably heavy snowstorm Everest region. Cloudiness likely decrease over plains after one day but atmosphere still remains unsuitable Everest region with intermittent snow showers or blizzards and practically overcast skies at least next two days. Visibility fair to good over plains but very poor near cloud-capped peaks. Upper winds above six kilometres mainly between west and west-north-west. Strength about 50 to 60 miles an hour between six and seven kilometres increasing to 70-80 miles an hour or more (100) higher up between eight and 10 kilometres. Purnea sea-level pressure 29.72 inches."

It will have become evident that the month we spent at Purnea was a curiously full and varied time. To look back upon it is to wonder how so much could have happened, so many things have been done and so much solid work have been accomplished in such difficult conditions. There was much to be enjoyed in it and there was some satisfaction to be had from the fact that we and our equipment came safely through the storms and troubles. Purnea had the double effect of making us feel well and comfortable and of infecting us with a dour determination not to be baulked of our main objective. During the second fortnight we came slowly to realize that we should have to wrest what we wanted out of a set of hostile conditions. The Committee at home were to

be opposed to us, and impossible weather threatened amongst the mountains. It gradually became an accepted, if unspoken, assumption that we must take upon ourselves a responsibility undesired, and also a risk which, in our ignorance, we had promised to the officials at the Air Ministry would not be taken.

In all the pleasant recollections of Purnea there runs this undercurrent of harsh compulsion. This account may have conveyed some impression of the happy days compounded of healthy activity and new scenes and experiences, but the sense of frustration which oppressed us when weather and events seemed to conspire against us is probably beyond reasonable expression. The thing which relieved it and encouraged us at last to overcome it was the unity of the party which lived and worked together in that bungalow which the earthquake has since destroyed.

The Air Commodore and Mrs. Fellowes were with us in our fight for permission from home and they worked valiantly to overcome opposition. Barkas was in agreement with us because a second flight promised him more films of Everest and because he recognized the incompleteness of the first flight from our point of view. Blacker was as much committed as were the pilots to the completion of the survey. Shepherd, sharing a room with M'Intyre, understood how deeply the pilots felt on this point and became our ally to such an extent as to risk his journalistic reputation in our cause. Ellison and Bennett were as keen to see the job properly done as if their own credit were at stake. And mechanics and aircraftmen were ready to do all they could, if authority had to be defied in the interests of achievement.

We had our little disagreements and our occasional grievances, on one score and another, but one opinion alone prevailed in the camp on the subject of completing the job once begun. The full story of the second flight and how it



BONNETT CLYDESDALE BLACKER EHTERTON MINTYRE
Donning heated clothing carefully to avoid perspiring



M'Intyre before the first flight Note the small mirror
on the windscreen to avoid having to turn and risk

came to be made, is told later. It is mentioned here because the series of events which led up to it coloured our daily life at Purnea and had a deep influence on the party as a whole. It drew together the rather diverse strands of life and gave them a pattern and a texture which the ordinary course of the expedition, free and unimpeded, would not have produced. We worked steadily and played heartily and gaily enough at Purnea until the spectre of dispossession and defeat arose. Thereafter the tone of life was changed. We still worked and played and kept our bodies fit. We still concentrated on translating luck into terms of prevision and preparation. But below the surface was the sense of extraneous opposition and an unexpressed resolve to meet it. There can rarely have been a case in which a party of men set their teeth so resolutely and, saying little about it, came so unanimously to the same decision.

Purnea brought us ultimately to a sort of grim unity, we had not expected to achieve, a unity of a type which could only obtain as long as the prime cause of it remained and could scarcely have been brought into existence by anything besides, except extreme physical misfortune such as we were not called upon to bear. It was not strange, of course; that we should have to overcome our main difficulties on the ground. Our creed required that everything that could be done should be done before we started flying towards Everest and that was not hard to carry out when a routine had been established and habits formed. But we were unfortunate as to weather and hampered by those at home who feared for our safety and the safety of our machines. The challenge which knit us together was less the challenge of Everest than that of those who would have had us abandon a half-finished task. That challenge was taken up at our base and there at Purnea the real battle of the survey of Everest was fought.

CHAPTER VI

FIRST FLIGHT OF THE HOUSTON-WESTLAND.

(Clydesdale)

The two flights in which M'Intyre and I took part over the high mountains were as different in character as the weather could make them. For the first, we waited until the conditions justified an attempt; on the second, other circumstances made delay impossible and the machines took off in what from the ground appeared impossible conditions.

The morning of 3rd April was started with high hopes created by the combined knowledge of improved weather conditions and that provision had been made to meet all expected contingencies. It was considered that the care of the survey cameras should ensure that they would work properly; it was not realized that bumping along in motor cars over rough roads might disturb their delicate interiors. Nothing seemed to be left to chance, but the unknown quantities of atmospheric conditions over the high mountains.

On the strength of the weather report on the morning of 2nd April, the whole party had assembled on the aerodrome at 7.0 a.m. The velocity of the wind at a height of 24,000 ft. that morning was only about 49 miles an hour. That meant that it might not exceed 60 miles an hour at 30,000 ft. Preliminary preparations were made for an attempt. Air Commodore Fellowes had left at dawn on a flight to the Nepal border to discover whether conditions justified an attempt being made.

The Air Commodore returned in less than an hour with the report that there was mist up to 10,000 ft. and that clouds hung above and beyond Everest. That was an ambiguous



Above cloud layer at 20,000 feet with Everest distinguishable by the plume about sixty miles distant. It can be seen that the aircraft is heading well to the left of Everest to allow for the tremendous drift.



Approaching Everest from the West on the second flight. The Nangpa Pass (14,000ft) can be seen in the centre on the horizon, where the highest peak is Cho Oyu (26,730 ft) with Gvachung Kang (25,910 ft).

report. It was uncertain whether the clouds would thicken or clear. So, while the Air Commodore ordered and supervised the taking of fresh wind observations at the little meteorological station, Ellison went off to make another reconnaissance in the Puss Moth. He found a continuous bank of cloud over the 90 miles between Everest and Kangchenjunga, and gave the impression that the clouds were banking up. By this time the wind strengths had been checked, though at 20,000 ft. the balloon had disappeared from view owing to obstruction from the sun. The wind was still moderate, and as it seemed a pity to waste such good wind conditions, I took the Gipsy III up to observe the conditions further. The cloud formations had increased and were spreading along the range. It was decided, therefore, with much reluctance, to abandon all thought of attempting the flight that day.

The weather report brought in by Mr. Gupta, the meteorological expert, the same evening, hardly supported his prophetic assurance. At 21,000 ft. the wind's speed was recorded as being in the region of 72 miles an hour; at 27,000 ft. it was about 62 miles an hour. The inversion was unusual and might have been taken to indicate a change in the weather, but there seemed no grounds for so certain a forecast as Mr. Gupta presented. However, the crews of the two machines went early to bed that evening buoyed up by Gupta's encouragement.

Dawn of 3rd April presented not too clear a day. There was a dust haze and visibility was less than 10 miles, which is below average distance at that time of year.

Balloon observations were taken to a height of 30,000 ft., and its rate of drift at that height showed a wind-speed of 58 miles an hour. Air Commodore Fellowes had left just before daylight to reconnoitre the sky above. The wind

velocity had further dropped from that previously experienced. The Air Commodore, flying alone in his lightly loaded Puss Moth, climbed steadily through the early morning haze.

At 17,000 ft., which was almost his aircraft's ceiling, he was still not clear of the haze when his engine cut out and he at once put the nose down and prepared to make a forced landing. When he had dropped to 15,000 ft., the Gipsy picked up again, and he climbed once more towards the blue sky he could see above. Once more in the neighbourhood of 17,000 ft. his engine stopped firing and he had still not got to the surface of the dust haze. This time he was more unfortunate and lost 7,000 ft. of height before the engine began once more to fire. Then it started very uncertainly and continued to fire and stop. Thinking it wiser to get back with such news as he had, the Air Commodore made for home and came limping in, to find Hughes anxiously waiting the chance to take over his baby and discover the cause of its coughing. The Air Commodore reported that no clouds were visible. The dust had prevented him seeing the high mountains or even the foothills, but he believed that some sign of clouds would have been perceived had any existed, and he considered conditions justified an attempt.

In the hangars certain preliminary preparations on the machines had been made. Cameras were fitted, the bottles of oxygen were put in and the oxygen systems tested, the tanks were filled up with petrol and oil. The Air Commodore, on his return, ordered the machines to be started and final preparations to be made. The crews pulled on their heated flying clothes and boots; we were extremely hot even at that hour of the morning. A ground temperature of only 25 degrees C. was rather too much for comfort in what Blacker called our "stratosphere suits."

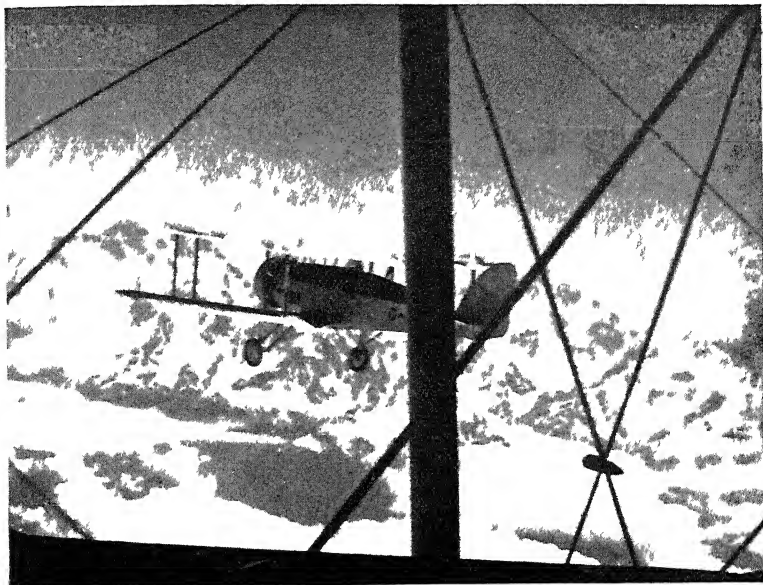
Pitt, the mechanic of the Bristol Company, started the engines and warmed them up. They had to spend rather more time ticking over than they needed because of the time taken in loading up hand cameras, cinema cameras, plates, films and, finally, ourselves. At last everything was ready. Masks were properly tightened up. Gloves, telephones, heating switches and the like were all tested. After several minor adjustments things were satisfactory, and the aeroplanes taxied out to take off. Barkas, the Gaumont-British expert, had asked the pilots to take off in a particular way for the benefit of the camera men whom he had stationed at various points about the aerodrome, but when it came to the time the take-off was effected in the easiest and best way in order to save any trouble. Films at that moment of slight tension seemed quite a secondary consideration to us.

Careful arrangements as to procedure on the flight had previously been made. I was to lead and M'Intyre was to fly in wide-formation on my right. On occasions he was to alter his position at his own discretion to enable his observer to take what photographs were wanted of my machine against the background of the mountains. Normally, he was to be just behind on my right. We climbed the aeroplanes slowly at a very moderate throttle-opening, in order to save the engines as much as possible during the early stages of the climb until it was certain that all the essential apparatus was working satisfactorily. The arrangement was that at 10,000 ft. M'Intyre should come in close and we should signal to each other if everything was all right after having tested in the air all the equipment such as oxygen, switches and cameras. The test that concerned the pilots most of all was checking the flow of the main and reserve supply of oxygen, each of which was tested independently.

At 10,000 ft. the satisfactory signal was mutually given.

Everything was working excellently in both machines, with the exception of my telephones. These telephones had worked well on both test flights, but as soon as Blacker and I tested them in the air, they started buzzing, and this we could not stop. It was annoying enough at the start, but the noise seemed to get worse as the aeroplane climbed, and became more and more irritating. Neither of us could hear a single word the other spoke. This may have been just as well, because our language deteriorated with the continuance of this incessant noise every time we tried to communicate with each other. The telephones became useless, and all communications had to be made by notes written on slips of paper.

The machine climbed to 10,000 ft. at low engine revolutions and we were near Forbesganj in rather less than thirty minutes. Weather conditions were as the Air Commodore had reported them, except that, as the foothills were neared, the dust haze thickened and visibility was much reduced. With 10,000 ft. of haze beneath us it was almost impossible to distinguish landmarks. Anxious about the river junction which was to have served as the key to the projected survey strips, I had already climbed slower than I had intended in the hope that this might improve the chances of finding the control point at Komaltar. It had been arranged that this should be the starting point for our vertical photographs as being one of the few easily identified points plotted accurately on existing maps. When we reached the foothills, the haze had become so thick that the country disappeared altogether from our view and it was necessary to navigate almost entirely on a compass course. It was possible to see one aeroplane from the other, as they flew in formation. It was not blind flying in the true sense, because there was some indication of blue sky above. It was therefore possible for the pilots to satisfy themselves without the use of blind-flying instru-



Houston Westland climbing with Everest plume
streaking Eastwards

MAKALU



CHAMLANG
RANGE

Approaching Makalu from the South

ments that the machines were flying more or less on an even keel.

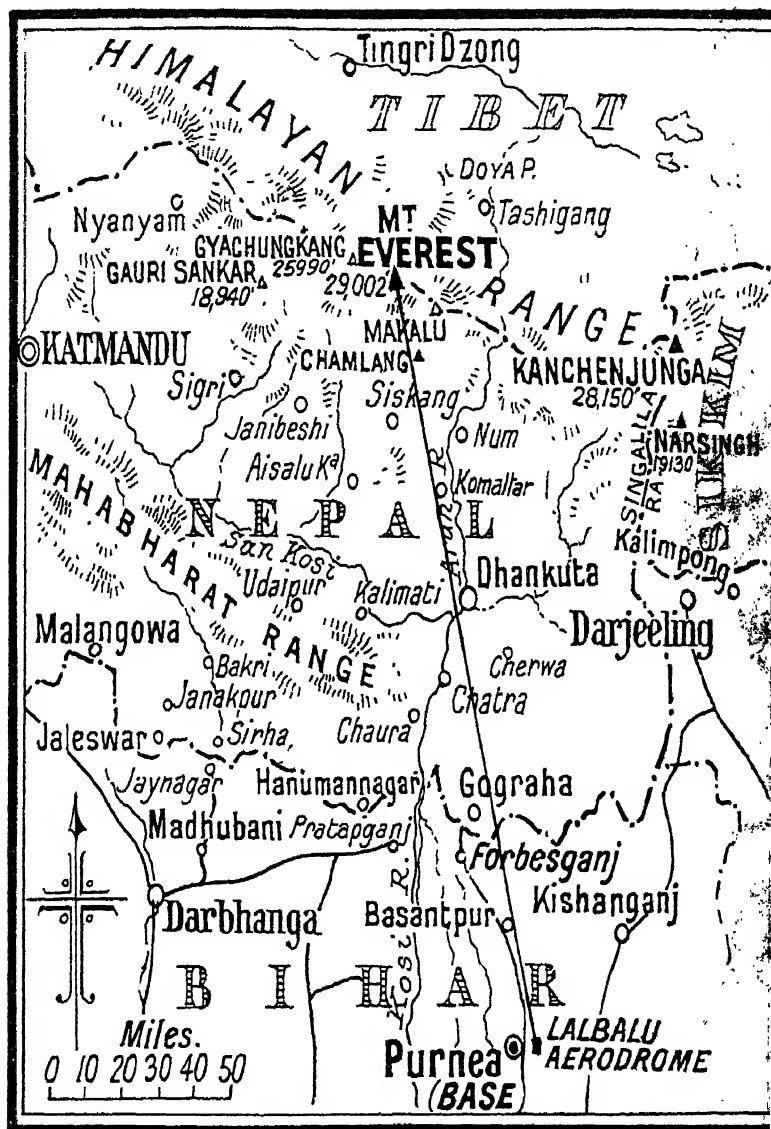
All hope of finding Komaltar had to be abandoned and the engines were opened to full revolutions. The machines climbed rapidly until, at a height of just over 19,000 ft., they started to emerge from the haze, and at 20,000 ft. were clear. At the surface of this dun-coloured sea, we were met by a truly amazing sight, which gained in impressiveness by contrast with the dullness of our climb through the haze. After taking off and flying at times practically blind in the haze for over half an hour, we found ourselves emerging into the most vividly clear atmosphere with unlimited visibility. The aeroplanes seemed to be enclosed within a semi-circle of the most gigantic mountains in the world. This time they really looked enormous, because we were seeing them from much closer range than we had ever seen them before. Just to the right of the aeroplane's nose as it rose clear of the murk, the summit of Mount Everest appeared with its plume, like the smoke of a volcano, stretching out to the east but in proportion rather shorter than we had seen it on previous occasions, indicating that the wind velocity was less than when we had usually observed it. Everest was probably nearly 50 miles distant when first sighted.

A little farther to the right stood the majestic Makalu, which, because of the angle of our approach, looked even higher than Everest although in fact about 1,200 ft. lower. Something like 100 miles to the east rose the great massif of Kangchenjunga, not appreciably nearer to us than it had already been on sundry reconnaissance flights, yet seeming to be much nearer on account of the extraordinarily clear air and the greater height from which we were seeing it. To the left was the remarkable pointed peak of Gauri Sankar, about 100 miles west of Everest. This panorama presented

itself to us in its startling white beauty, glistening in the bright morning sunshine and making a magnificent spectacle. The dust haze, completely obscuring the foothills, rose well above the snow line, with the result that this arc of great mountains appeared detached from the earth, and suggested an eerie land floating in a drab sea somewhere between earth and sky.

Visibility was virtually unlimited. Mountains could be seen far away to the north-east of Kangchenjunga and to the west of Gauri Sankar; these must have been at least 300 miles away, probably a great deal more. Distances are not only difficult to estimate, but, in fact, they tend to shrink when the eye can find nothing but these huge mountains and may light on no other form of landscape to serve it as a check. I was not alone in this distrust of the evidence of my eyes. Blacker reported having seen in the far distance mountains he could not place on the map, and wondered incredulously whether there could be any substance in the tales of unknown ranges mentioned by lonely wanderers in Asian hinterlands. Bonnett, M'Intyre's observer, who had already done a lot of flying also, agreed that it was impossible to gauge distances in this strange world of snow peaks, enormously deep precipices and glaciers, cut off from familiar things and perspectives.

By this time we should have gained a great deal more height than in fact had been obtained. It had been previously planned to effect a faster and more constant climb. Two-thirds of our ground distance had been covered to the peak of Everest, and according to the original arrangement our working height of 33,000 ft. should have been attained. The reason for this discrepancy in our calculations was entirely due to the fact that, owing to the dust haze and poor visibility, we had kept comparatively low in order to try to locate Komaltar.



Map of the Purnea—Everest District and country north of the Lalbalu Aerodrome

(Reproduced by kind permission of "The Times")

Soon after coming into sight of Everest, I had opened up the engine to full climbing rate of 2,000 revolutions a minute in order to gain height quickly before we should find ourselves close to the mountains. The engines responded without a murmur, but for some time the great peaks appeared to get no nearer. The oxygen supply now began to be a matter of the first importance. I had turned the supply on at ground level, and had regulated the flow so that it should be appropriate to an altitude 5,000 ft. in excess of the indicated height. Thus, at 25,000 ft. we were taking what should have been a sufficient flow of oxygen for something slightly less than 30,000 ft.

This extravagance in oxygen suddenly struck me as excessive in proportion to the apparent slowness of our approach to the objective. The climb was excellent, but what of our forward speed! The aeroplanes reached 30,000 ft. in what seemed a very short time, yet the mountains still appeared to be nearly as far off as when we had first sighted them. I should have realized that this illusion was due to the fact that the visual change in size must be very gradual in such enormous masses of rock and ice; but the mind does not work as easily at 30,000 ft. as it does at ground level, and I suppose, subconsciously, native caution asserted itself to command a husbanding of resources. Anyhow, from this time onwards I began to economize a little in oxygen so as to have plenty in reserve if we had to be away longer than expected. I still kept the supply of oxygen as shown by the flow meter up to that proper to the indicated height as shown by the altimeter, but after our earlier, lavish supply, this economy had rather unpleasant effects.

Blacker soon passed an urgent note through to me to say that he was getting insufficient oxygen. This did not surprise me, as the observer's tube from the cylinder to the mask was

a good deal longer than the pilot's, and, moreover, the observer was undergoing a much severer physical strain. The pilot was sitting still, and was in a physically passive condition all the time. His duty involved less violent exertion than the observer's. Blacker had been standing up in the cockpit, lifting heavy cameras, taking photographs and performing the 46 different duties he had so carefully categorized for each observer, and it was evident to me that he needed more oxygen than I did. Just at this moment I imagined that I too felt the first symptoms of insufficient oxygen. My eyesight began to be a little uncertain, and also at the same time I had violent cramp in both feet. This could not have been due to cold because my boot heaters were switched on. I immediately turned on both reserve and main supplies of oxygen to the full flow position and began breathing in deeply, at the same time kicking the rudder bar right and left to get the circulation back into my feet.

After a few deep breaths my cramped feet began gradually to relax, and soon the trouble disappeared almost entirely. Needless to say, I felt greatly relieved. I then turned off the reserve supply but kept the main supply full on. I did not tell this to anyone at the time, but a week later when I mentioned this experience to Bennett, the doctor, he said that this was caused by lack of oxygen. This was the only unpleasant physical sensation I had during the whole flight. A few minutes later, mountains suddenly seemed to be closing in on us as quickly as in the previous half-hour they had advanced slowly. Makalu was abeam of us, Everest ahead. We suddenly realized that we were at the right angle which would have been made by lines drawn from the two summits to our position, and that Makalu was not very far away, as may be seen from the excellent photograph of the west arrete



The knife edge South West arête of Makalu (-7,790 ft) which lay down wind on our right

of Makalu which M'Intyre's observer obtained from this position.

The ground was rising very steeply about us now, and the thought came back to me with some urgency that we were less than 31,000 ft., a good deal lower than we had intended. We had wanted to cross the summit at 33,000 ft. true height, so that we should have plenty of air-space between us and the peak. It was necessary to concentrate on climbing, and I computed the altimeter height according to the temperature. This meant a very simple calculation in readiness for which we had set a corrector ring around the edge of the altimeter dial, and it was now that I found that in those conditions of high altitude I was thinking rather feverishly. It is, I think, a common experience that in such conditions one does not reach normal efficiency, and I worked anxiously and arduously at those calculations because I knew that there must be very little margin between our height and that of the summit of Everest.

I took the temperature of the air as shown by the thermometer fixed to the strut between the port wings, found its equivalent on the corrector ring and read off the corresponding figure. We had reached a corrected height of 31,000 ft. That is to say, we should have nearly 2,000 ft. to spare at the summit. I was beginning to feel happier when, within a few minutes' distance from the summit, we discovered that our course had been laid a little too far to the east with the result that we were approaching right on the leeward side of the mountain. Almost as soon as the thought occurred to me, we encountered a powerful and persistent down-draught due to the deflection of the wind over Mount Everest. We had not been unconscious of this possibility. Indeed, we had plotted our course with the object of avoiding it and, flying religiously on that course, had

found a stronger beam wind than had been forecast. Down-draughts in the lee of hills are well enough known, especially among glider pilots, and the same uncomfortable disturbances occur in large mountains only probably in a greater degree.

On the windward side of a mountain the wind is deflected upwards, and all round the top of a crest as a rule up-currents are to be found for well-known reasons, whereas at some distance from the summit on the leeward side, the deflection is downwards. This is what usually happens, but in certain winds and with hills of certain shapes and particularly where winds blow across gorges, the initial deflection may be downwards instead of upwards, or the wind may form eddies and turn itself into a sort of horizontal whirlwind. The down-draught into which we flew just as we thought we had managed our climb fairly well was, in the circumstances, quite to be expected. My mistake arose through approaching the mountain too much on the leeward side. But it was none the less disturbing to find ourselves in a downward current whose velocity and extent could not be foretold.

Within a few seconds we lost 2,000 ft. of height. This brought us down to below the level of the summit, and the peaks of Lhotse seemed uncomfortably close. M'Intyre, being on my right, was more in the full force of this down-draught and was carried down farther than I was. I believe he edged away a little more to the right with the object of placing himself over the valley between Everest and Makalu in case the downward course should be prolonged. M'Intyre and I had previously arranged that in an emergency each pilot should act independently. At this point we were separated, and the relieving thought flashed across my mind that it was not a squadron I was leading but a single machine piloted by an officer quite capable of looking after himself. Down we went irresistibly in this current, although the engine throttle



Houston-Westland approaching the summit of Everest from the South about five miles distant. In the foreground can be seen the terrific amphitheatre of the Southern cluster of peaks which form part of the Everest Group

FIRST FLIGHT OF THE HOUSTON-WESTLAND 121

was wide open and the machine still at its maximum climbing angle. I ignored flying by instruments, and flew entirely by sight, watching Lhotse carefully to make sure that I should be able to clear it. These peaks I actually cleared by a smaller margin than I cared then or later to think about, and in doing so I went through what appeared to be part of the plume of Everest and received the one and only bump, a moderately hefty one, that I experienced throughout the flight over the high mountains, an area for the most part of incredible smoothness. The bump doubtless marked my passage from the area of down-currents into that of up-draught, for as soon as the machine cleared the southern peak, I was conscious of additional lift and the machine gained height very rapidly. The result was that having been below the summit as we approached Lhotse, we now rose directly over the summit of Everest, and cleared it comparatively comfortably by about 500 ft.

Several things now began to demand the attention of my mind. One of these troubles was that I discovered that the vertical camera had stopped working and, struggle as I might with it, I could not persuade it to start again. The failure meant that my survey strip would not include a vertical photograph of the summit, and in these circumstances, I decided to enable Blacker to obtain the best possible oblique photographs.

I had always cherished the faint hope that it might be possible visually or by photograph, to establish that Mallory and Irvine, who lost their lives so gloriously in 1924, and were last seen attacking the final 1,000 ft. of Everest, had actually reached the summit. I had always liked to think that they had conquered the mountain after the gallant effort which deprived them of their lives. As I came over the top, I tilted the right wing and looked down on the summit. It was

just a passing glimpse, and it was not possible to discern any hint of human remains or of the apparatus of mountaineering. As I saw the summit from various angles during the next few minutes, I began to realize that it was most unlikely that any trace of them could be seen from the air. To the east and south was the steep snow-face on which they could not have lain had they fallen, unless they had dropped into the small concave area just below the actual peak, and there they would almost undoubtedly have been covered with snow. Had they been lying on the black rock of the northern face, broken and seamed and patched with snow-pockets, it would have been impossible to distinguish them, even from the modest height of 500 ft.; and it was highly improbable that they had ventured beyond the summit to the precipitous fall on the western side.

M'Intyre and I had arranged a cut-and-dried procedure to be followed on reaching the summit. This allotted to me the duty of turning into wind to the west to photograph the unknown west side of Everest. Immediately after crossing the peak on a north-westerly course, I turned to the left and looked down. I could see the peak just behind the left wing and it seemed absolutely stationary. In other words, the wind velocity appeared to be equal to the machine's speed. This was not actually the case, but when I had got a little way farther to the north-west of the mountain I considered it inadvisable in the interests of safety to fly at my then relatively low altitude on the windward side of the peak lest the machine should get unexpectedly into one of those unusual windward down-draughts.

I therefore departed from the pre-arranged plan and turned 180 degrees to the right over the Rongbuk glacier and towards Makalu, looking down almost vertically as we passed over the peak of Everest. I had the curious feeling as I saw

it from that position that this was very much the same as many other peaks I had looked down upon in Switzerland. The next second, as I caught a glimpse of the glacier of what appeared to be a huge precipice on the north and east sides of the north-east ridge, I changed my opinion and knew that I was seeing far more than I had expected to see even on this mountain of mystery. I distinctly remember these different, mutually contradictory sensations crowding one on top of the other.

Nevertheless, the thought flashed then through my mind that the machine was behaving in relation to the great mountain just as my Moth had behaved in relation to some of the mountains in Switzerland over which I had flown four months previously. At this altitude it was quite easy to turn the aeroplane very steeply without losing any height and without any diminution in the power of control. I turned quite steeply over the Rongbuk glacier, and with restored confidence had put out of my mind the disquiet caused by the down-draught and insufficient altitude. Meanwhile Blacker was busy, as he had been the whole time, taking photographs over the starboard side of the peak and the north-east ridge.

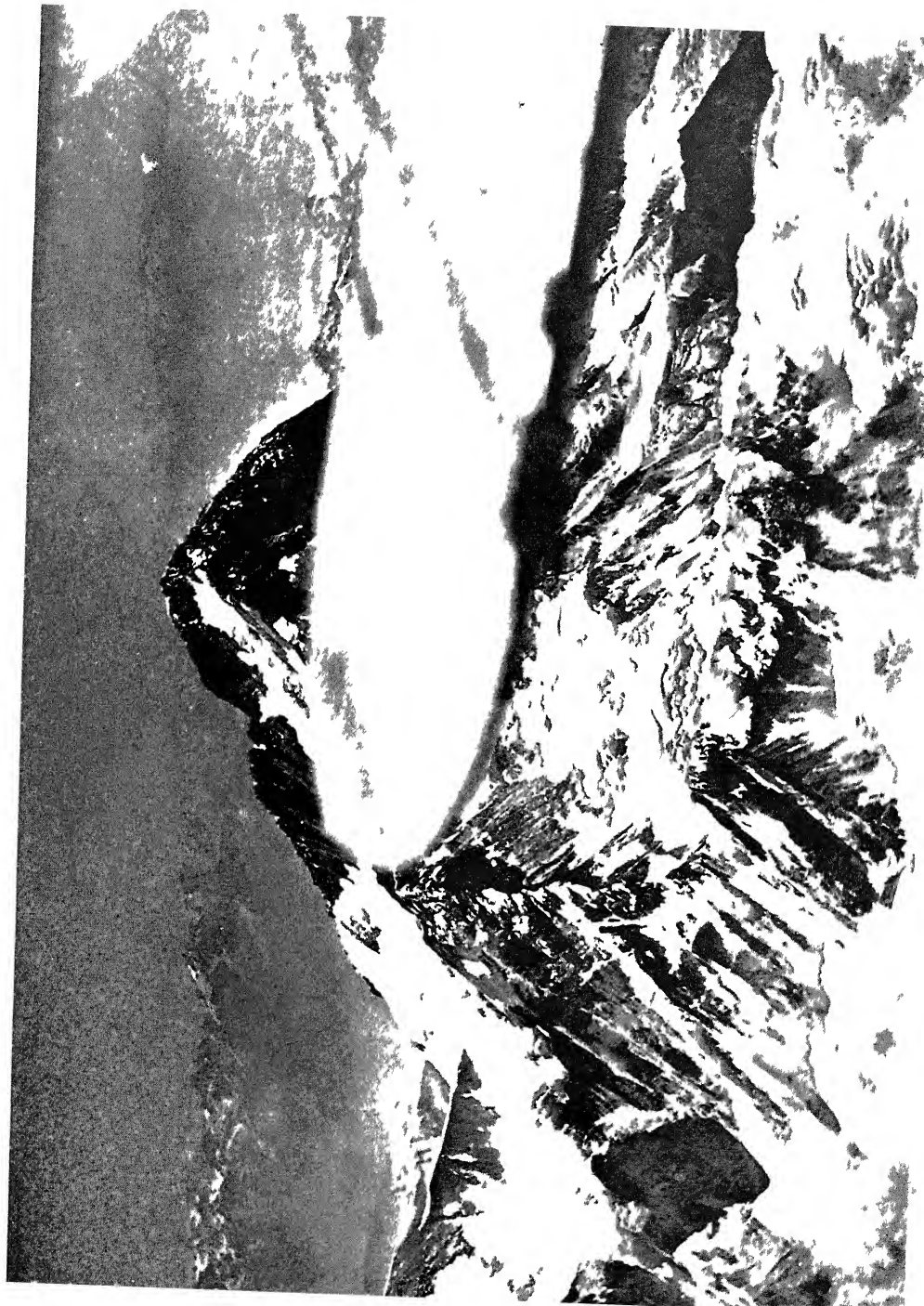
Looking round at him as I began to turn towards Makalu, I saw him take a shot at Everest over the tail and then disappear into the cabin to change a film. M'Intyre, whom I had not seen for some time, was travelling in the opposite direction and we passed each other somewhere to the north-east of the summit. He had evidently lost a good deal of height, much more than I had, and was still climbing hard. As the west side of the mountain seemed out of the question, Blacker and I concentrated on dealing with the north-east ridge. I turned the aeroplane again 180 degrees while Blacker continued to change plates or films in the depths of the cabin. On emerging to resume operations, he failed to realize that

THE PILOTS' BOOK OF EVEREST

I had turned and that by this time we were heading for Everest. The last thing he had seen over the tail before diving into the cabin was the peak of Everest, and on putting head and shoulders once more out into the slipstream, he was again tempted to train his camera on the peak that he saw over the tail. By reason of our changed direction, this peak was no longer Everest but Makalu. I happened to look round just as we were again approaching the north-east ridge, and saw Blacker sighting the camera in the opposite direction at Makalu. Attracting his attention by hitting him on the shoulder, I pointed out which was Everest. In a second he realized his mistake. It was only a momentary lapse, a very easy and natural error, but even at the time it struck me as being comical and made me chuckle into my mask.

Passing the north-east ridge this time, I felt I had so much control that we might safely have gone considerably lower. Blacker worked furiously to make the best possible use of those precious minutes. How he supported the physical strain at that height with an oxygen mask which was only approximately efficient I do not know. He got some excellent oblique photographs and deserved the greatest credit for the work he did while we remained in the vicinity of Everest. For a few minutes we circled round towards the north while M'Intyre completed his trip over and around the summit. Then I turned again to the right over the Rongbuk glacier and began slowly to move down over the valley and turn for home, keeping a steady course over the valley between the two great peaks. M'Intyre by this time had rejoined me, and we flew home together, taking photographs of the different peaks as we went. The take-off from Lalbalu was at 8.25 a.m.; we were on the ground again at that aerodrome at 11.25 a.m. We had crossed the summit of Everest at 10.5.

As we came back into the plains the midday heat seemed



View over the tail plane of Makalu (27,790 ft) as machucos approach the summit of Juvist. Photo graph taken from North-West and shows the Arun Valley with the mountains of Nepal in the background.

appalling after the refreshing sights of snowfields and glaciers and the clean, brisk air of high altitude. Sweltering in our thick, heavy clothing, we crawled out of the cockpits, turned over machines and cameras to mechanics and stripped for a plunge into the bathing pool. The only hint to those who had waited on the ground of the risks we took was contained in M'Intyre's suggestion to Bennett, the doctor, that he should have a look at Bonnett. M'Intyre had not only had the worst of the big down-draught as we approached Lhotse, but he had also been convinced that something was wrong with his observer while he was over Everest and had suffered the anxiety which arises from being unable to discover the true state of affairs and of being prevented by the very nature of the exploit from rendering help to a comrade in distress. When once the two machines had become separated, I knew little of what happened to M'Intyre and Bonnett in the Wallace. It therefore seems desirable to give M'Intyre's account of the flight in his own words.

CHAPTER VII

FIRST FLIGHT OF THE WALLACE

(*M'Intyre*)

The morning of 3rd April saw us all up and rushing about the bungalow at day-break. Air Commodore Fellowes left after a hasty breakfast for the aerodrome to make an early reconnaissance flight in the Puss Moth and get back before we should have the Everest aircraft out and ready for the flight. Mr. Gupta had released a high-altitude balloon with the first glimmer of daylight, but unfortunately had lost it in the dust haze before it reached a useful height. We saw him watching his second balloon as we passed on our way to the aerodrome, silhouetted against a dust-laden dawn, eye glued to theodolite, and surrounded by his assistants busy writing down the results as he shouted them out. It took a balloon something like an hour and a half to reach 35,000 ft. so a car had been left to rush him out to Lalbalu with the completed wind readings.

We bumped down that nine miles of dusty track, each clutching a camera or one of the more delicate instruments to our chests in an endeavour to make our bodies absorb as many of the shocks from the bumpy track as possible. The ground staff were already busy on our arrival. The canvas hangars had been opened and the great machines were being ~~man-~~handled out on to the aerodrome. The bottles of oxygen were carefully placed in their clips and connected to the system. The vertical cameras were fitted and tested, air-frames and engines were inspected and tested in every detail.

Pilots and observers fussed around their equipment, trying on oxygen masks which they had tried on many times



The crest of Everest appearing above its plume showing the North East ridge on the right over which the machines had to climb out of the down-draught

before, readjusting straps, electric leads and oxygen feed pipes that had already been adjusted to a nicety, rechecking the carefully prepared points of navigation to allow accurately for the increasing wind speeds during the climb—all trying to keep themselves occupied during that tense half-hour's wait for the return of the reconnaissance machine.

There had been so much preparation for this flight and there was still so much of the unknown about it that even the crews could not help being slightly affected by the general excitement. Waiting is always unpleasant and we were all relieved to see the Puss Moth diving down through the dust haze. At the same moment a dust-covered car swung through between the Indian sentries at the aerodrome gate entrance bringing Mr. Gupta and his high-altitude wind-findings. The Air Commodore brought welcome news. Though he had been unable to climb above the dust, he had been able to see towards the mountains through the top of the haze and there was a cloudless sky. This was splendid, no cloud to mar the photography. Mr. Gupta was not so good. He lost the balloon at 30,000 ft. where a wind speed of 58 miles an hour had been recorded.

We had promised not to attempt the flight if the wind exceeded 40 miles an hour, but this was the first time we had found the wind under 100 miles an hour. We worked out the implications and reckoned that, provided we did not spend more than 15 minutes at the summit, we could get back inside our petrol endurance. We might wait for days and weeks and not get another opportunity, especially as the forerunners of the monsoon might be upon us almost any time now. The Air Commodore weighed the position carefully and gave the word "Go."

Struggling into our heated clothing required time and care. It was necessary to go slowly and avoid perspiring as

this would have added to the cold and discomfort over Everest. First came the heavy flying suit proof against wind, water and fire and lined with electric heating elements. Over this we drew on the boots of soft leather, also with electrical elements up the legs and along the soles, and connected to the suit by a plug and socket at the knee. The head gear gave the most trouble with its many leads and connexions.

This consisted of a leather helmet with telephones padded over the ears; goggles surrounded by a large fur mask and having tiny heating wires between two layers of triplex glass to prevent ice forming and obscuring the vision; and worst and most important of all, a big heavy oxygen mask with a combined metal microphone and oxygen feed in front. It looked rather like a nose bag and had to fit tight over the nose, mouth and chin. It came over the fur mask of the goggles, as otherwise oxygen might get into the goggles and affect the eyes, and it had a flap which came round and under the chin where it was held firmly by the helmet strap. It was all intensely uncomfortable and made it almost impossible to move the head without displacing some vital part of the equipment.

The three cables from the telephones, microphone and goggles were led round the back of the head through the shoulder strap and plugged into sockets on the breast of the flying suit. The flexible metal-covered oxygen feed pipe was led over the back of the head, anchored to the shoulder and brought round under the pilot's right arm to a bayonet connexion on the dashboard where it would be in easy view. All electrical leads from boots, gloves, goggles, telephones and microphone were led down through the flying suit to two multiple plugs on each side and were attached to sockets alongside the pilot's seat.

While these preparations were being made, the Pegasus

engines had been started. The crews climbed on board. Etherton handed the Everest mail up to Bonnett in the rear cockpit, a few last-moment instructions from Fellowes and we were off with a roar. We climbed slowly into the dust haze, up over the dry bed of the River Panar, over the maidan which has been called the world's polo ground and must be one of the largest stretches of level grass in the world, smooth as a lawn and two miles wide. The course followed it for some 30 miles until it swung to the left at Forbesganj and we continued straight to cross the Nepalese border east of Gograha.

At 16,000 ft. the plains beneath us became invisible and only the foothills around the gorge of the Kosi River could be seen dimly through the haze. At the height of 10,000 ft. we had arranged to signal from one aircraft to the other that aircraft and equipment were in fit condition for the work ahead of them. I was a little doubtful about the control of my survey camera but I signalled 'All Correct' to Clydesdale and was relieved to receive an 'All Correct' in return. At 19,000 ft. we suddenly came out over the top of the dust. It was absolutely level and it appeared as though we peeped over the edge of an enormous round table-top of brown ground glass. On the opposite side of the table, about 80 miles away, two white peaks were peering at us, Makalu clear-cut and dazzling in its snowy whiteness, and Everest with a long plume blowing, as it seemed, past Makalu and away to the east.

We were now in the strong westerly wind and continued to climb steadily, heading well to the left of Everest. As we rose the table became smaller and more peaks appeared over the far side until at last we were looking down on the whole of the table-top which stretched to all horizons and all the Himalayas above 19,000 ft. were sticking through its surfaces. The altimeter showed 30,000 ft. and we calculated that we must be somewhere over Komaltar, the point in the Arun

Valley, which was to have been the start of our survey. However, it was impossible to see down through the haze and we had to make a rough guess at the starting point and hope that the filters on the lenses of the vertical cameras would penetrate the dust.

Clydesdale's aircraft appeared to be climbing more easily than mine. The slower climb of the Wallace was probably due to its extra load represented by Bonnett's heavy cinema cameras and film. I was being gradually left behind and below. Everest loomed closer and as we passed to the right of Ghamlang it appeared to tower above us. We began to realize that we should have started to climb seriously earlier in the flight, but we reckoned we could still clear the summit by perhaps 1,000 ft. The wind was obviously much stronger than we had been told, the plume from Everest was streaking along the 12-miles range to Makalu at hurricane force.

As we moved on towards Lhotse, the southernmost peak of the Everest group, I noticed that something extraordinary was happening. The machine appeared to be climbing as well as ever, the engine was giving full power, yet we were being slowly blown down on to the westerly slopes of Makalu. A moment before its summit had been well below us; now it was towering a good thousand feet above. A hasty glance at the altimeter showed a steady decrease in height where there should have been a steady increase. The temptation was to try and climb faster which was impossible and would have resulted in a stall into the base of Lhotse.

We were in a tremendous down-rush of air. Though the machine continued to climb, it was climbing in an air current that was carrying it down at a much greater velocity. Two thousand feet were lost before the down-rush cushioned itself out on the glacier beds. We were in a most serious position. The great bulk of Everest was towering above us



Above and approaching the crest of Juvet immediately prior to entering the down draught which carried the acrobats down 2,000 feet

to the left, Makalu down-wind to the right and the connecting range dead ahead, with a hurricane wind doing its best to carry us over and dash us on the knife-edge sides of Makalu. I had the feeling that we were hemmed in on all sides, and that we dare not turn away to gain height afresh. There was plenty of air-space behind us, yet it was impossible to turn back. A turn to the left meant going back into the down-current and the peaks below; a turn down-wind to the right would have taken us almost instantly into Makalu at 200 miles an hour.

There was nothing we could do but climb straight ahead and hope to clear the lowest point in the barrier range. The machine was almost at its ceiling, apt to be sloppy on the controls, and the slightest error in flying would have meant a fatal loss of height. With the aircraft heading almost straight into wind, we crabbed sideways towards the ridge, unable to determine if we were level with it or below. A fortunate up-current just short of the ridge carried us up a few feet and we scraped over. The North East ridge appeared to sweep up vertically from our port wing-tips to the summit, and we could see straight down the sheer north side to the glacier cradles at the base of Everest. We were still far short of our objective.

Then started a grim fight for height. We had to turn very carefully towards Everest and then back over the ridge again with the little height we had gained and face the same fight over again. This business of turning towards the edge of a down-draught in order to climb seems even in retrospect a mad risk. At the time it was very much like a nightmare. The mind was obsessed by the knowledge that we must avoid being blown back on Makalu and yet must approach dangerously close to it in order to have sufficient space for a slow, gentle turn to the right without being caught in the

down-rush. The invisible menace of the down-draught had all the qualities of a nightmare. One had to try and imagine its limits and position from the topography.

Straight ahead lay safety which is unnaturally attractive and tempting to a mind weakened with lack of oxygen and low atmospheric pressure. The sense of responsibility for one's passenger in such a case threatens to upset all reason. An abnormal effort was required to make the decision and risk that turn towards the unseen down-rush, and then crab over the ridge once more. Three times we had to repeat this performance, gaining a little height each time, until we reckoned we had sufficient height to venture round the north side and over the top of Everest.

All this time Bonnett was working hard with his cameras, making the most of the quite remarkable opportunities afforded by this close encounter with the mountain. I often wonder whether Bonnett fully appreciated the seriousness of our situation during these manoeuvres. We have never discussed it, but it is almost unbelievable that a man could carry on working his cameras while the highest mountain in the world seemed to rush straight at him if he had any doubts about the machine's ability to clear it. This coolness was to save his life within the next few moments.

As we swept round to the north side of Everest and swung left to come over the top, Bonnett went below to fill his camera with film for the summit. While he crouched down in the cockpit he unfortunately trod on his oxygen feed pipe and on rising, pulled and fractured the pipe close to the mask. The first he knew about it was that he had weakened and could no longer support the weight of his camera. He sank on to the floor and with his remaining consciousness, checked over the oxygen flow and its heating apparatus. Finding nothing wrong there, he felt for a leak-

(NORTHEAST
RIDGE)



PTSE3

age, found the fracture and bound a handkerchief over the break. He made another vain attempt to struggle up into the slipstream with his camera.

The effort used up what little strength was left and he collapsed unconscious on the floor, while I waited for him to appear before going over the top. I had seen him slip below and soon realized that something had happened to him. I decided to go over the top, register the summit on the survey camera and then lose height as quickly as possible. My anxiety about Bonnett was counteracted to some extent by the sight of Clydesdale's machine to the north of the mountain. This was the first I had seen of the other machine since we were separated by the down-rush. As I turned, I saw it clear the top of Everest on a southerly course.

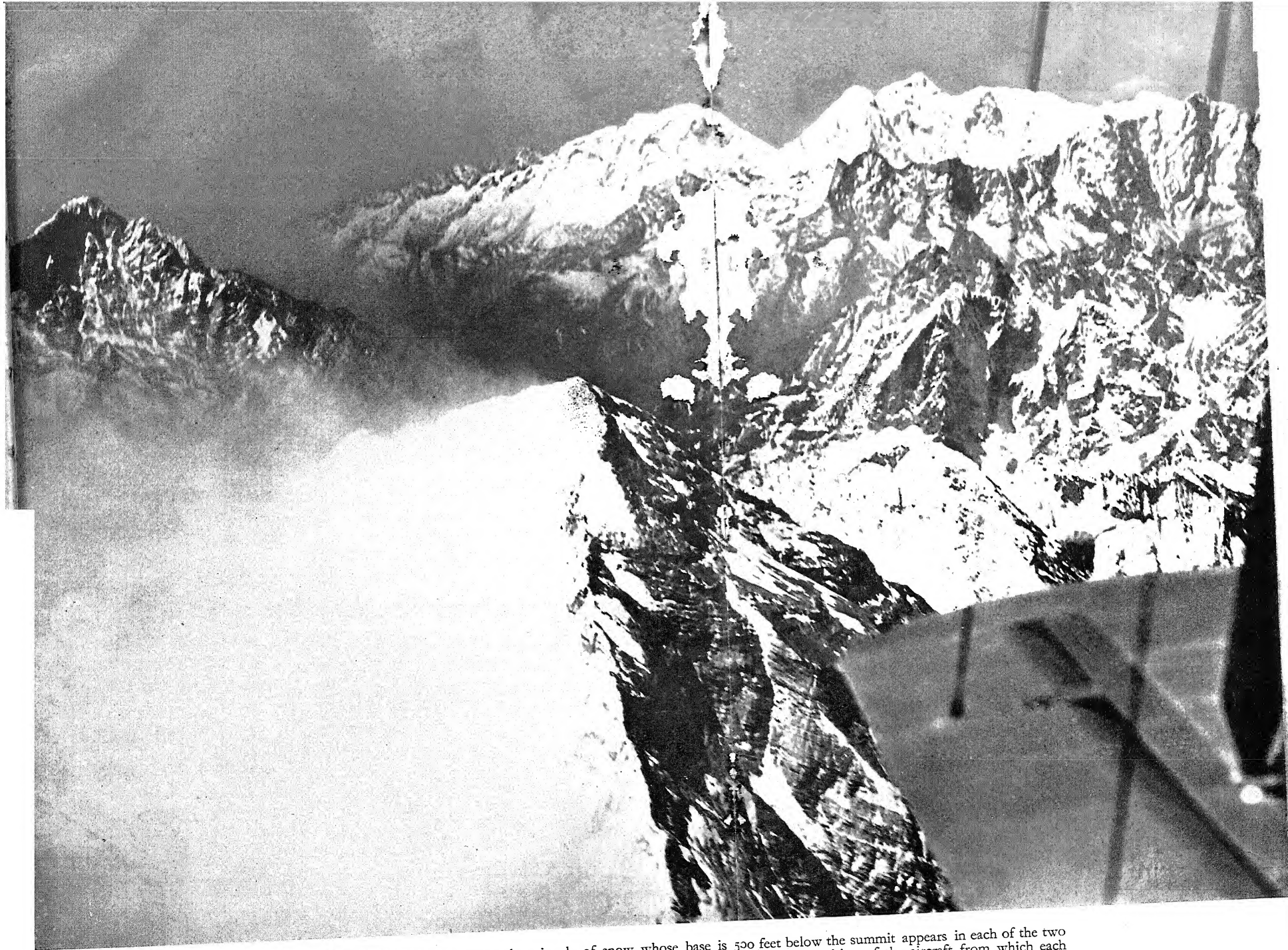
A hurried glance at the summit before it disappeared under the aircraft, showed a tiny platform that appeared to have standing room for about four people. I remember thinking to myself, 'Well, we are over the top, but what a failure from a survey point of view,' and then I suddenly had the sensation of freezing cold around the nose and mouth. I jumped immediately to the conclusion that the oxygen heating had failed. This was serious as it was only a matter of time until the water content would freeze in the valve and stop the flow. Actually, the complete metal nose-piece, carrying the microphone and oxygen feed had dropped from the mask and was lying on my knee. In my anxiety for Bonnett, I had no doubt turned my head too far round and dragged the nose-piece away from the mask. I quickly tried to get it back in position and refix it, but found this impossible with heavy gloves. I was compelled to hold it in place.

The first sixty miles of the return flight proved the most unpleasant I have ever experienced. Throughout that long half-hour I was holding the oxygen feed against the mask

with one hand and with the other flying the aircraft, regulating engine temperature, oxygen flow and altitude boost control. I was worried about Bonnett lying unconscious or dead in the rear cockpit, and was tempted to lose height faster than was safe to see if the figure of Bonnett would come to life with the decrease in altitude. Not a movement until we were over Forbesganj at 8,000 ft., and by that time I had given up all hope.

Then a reflection in the windscreen or some less tangible sense of movement attracted my attention and made me look round once more. To my intense relief, Bonnett was struggling up from the floor, tearing off mask and headgear. He was a nasty dark green shade but obviously alive and that was enough for the moment. Twenty minutes later we were circling the familiar landing ground at Lalbalu, canvas hangars, swimming pool and all. By the time we had landed, all our troubles seemed to have happened weeks ago, were almost forgotten and we were able to cope with the greetings and questions in a cool and collected manner. All I had to show for the swift and harassing troubles of that flight was a blister on the back of my hand where a heating element in the glove had done its work a bit too well. Bonnett emerged a little shyly with his damaged oxygen pipe and at my suggestion the doctor had a look at him. Beyond that we said nothing about the trials that had seemed so tremendous at 30,000 ft. above.

We handed the machines over to the excellent ground staff to be stripped of their instruments while we struggled out of that abominable flying kit. It would be impossible to express the joy it gave one to feel good, solid earth under one's feet and see growing things all round and, best of all, to dive into our swimming pool.



Immediately over the North-East ridge; the triangle of snow whose base is 500 feet below the summit appears in each of the two following photographs and in the preceding one, and serves as a guide to the relative position of the aircraft from which each photograph has been taken.

CHAPTER VIII

PREPARATIONS FOR SECOND FLIGHT

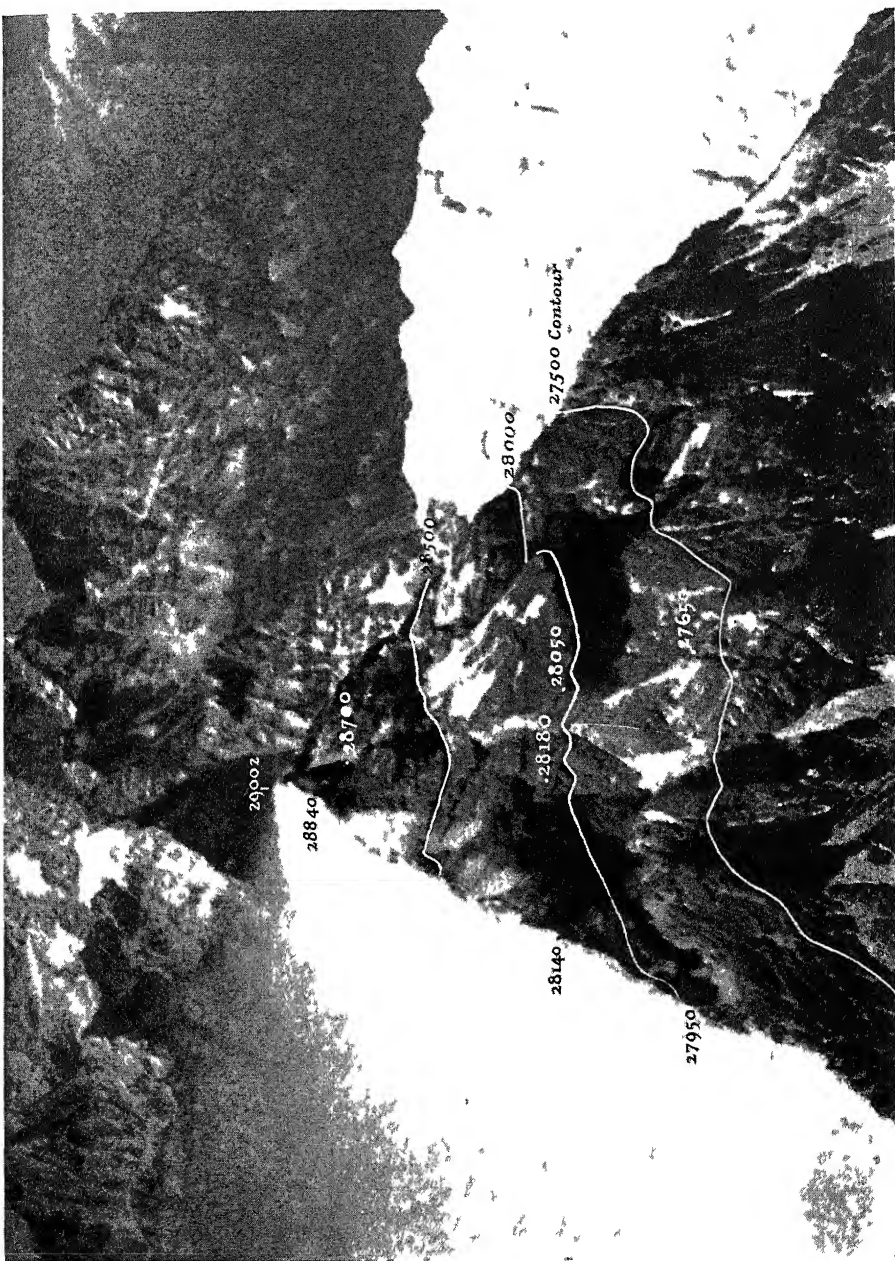
Both pilots were aware that the survey cameras had not worked continuously during the flight. We were also very doubtful as to the value of any vertical photographs that might have been obtained if, as we feared, the dust-haze had obscured the control point from the lenses as well as from us. Without some such clearly identified point it would be almost impossible to relate the survey strips to the rest of the country and so to plot their details on the map. It therefore seemed highly probable that we should have to ask the Nepal Government for permission to make a second attempt at surveying part of the southern face of Everest. Since our time and the fair weather season were both limited, we decided to waste no time in checking the photographic results.

There were nearly 40 plates to be developed in the little darkroom at the bungalow and there were the two rolls of survey film each sufficient for 125 exposures. These we were unwilling to experiment with. It seemed wiser to entrust the development of them to expert hands and we had arranged with the Calcutta branch of the Air Survey Company to help us in such a matter. M'Intyre now took those films in the Moth to Calcutta, stayed there the night and brought them back to Purnea the following day. Now we knew the worst and could formulate our request to the Prime Minister of Nepal on ample evidence. Very little appeared on the survey films and what little could be found proved of no value. On the survey side our trip had been a failure. An urgent request for a new permit was telegraphed to Khatmandu. Until it came, we could not go flying over Nepal, but, as the

weather remained relatively calm, the Air Commodore decided to order another high-altitude flight for the purpose of testing the survey cameras and other equipment.

On this flight of 4th April the official pilots were replaced by the Air Commodore and Ellison, who planned to make a visit to Kangchenjunga, a journey which could be made without crossing the Nepal frontier. The adventures which befell them were partly responsible for the subsequent opposition to our second flight over Everest. They became separated near the summit of the mountain and when Ellison was about to resume station on the leading machine, the Air Commodore began to turn to the left and Ellison had to turn away so steeply that he side-slipped for about 2,000 ft. Unable to rejoin his leader, he returned alone while the Air Commodore, having trouble with his oxygen mask and having to navigate for many miles over low clouds, laid a faulty course, realized he was lost, made an emergency landing at Shampur to get his bearings and eventually had to spend the night short of petrol at Dinajpur, some 60 miles east of Purnea.

The flight was most reassuring as to the survey cameras. They apparently worked perfectly all the time. The rest of the equipment was satisfactory except that the Air Commodore was even more critical than we had been of the clumsy mask which combined microphone and oxygen valve. The aircraft had not suffered in any way and the following day Clydesdale's machine was brought safely back to Lalbalu. But the incident had given us all a shock and the tale of it had disturbed people at home. No one in the party would wish to undergo again the trying three hours on 4th April when there was no word or sign of the Air Commodore. Ellison was back three hours after he had left. All he could tell us was that he had last seen the Air Commodore 2,000 ft. above him disappearing over the edge of the huge summit and



Farther over the North-East ridge. The aircraft is about to turn left and come over the summit from the right of this photograph

making for the northern side of Kangchenjunga. When another hour had passed we began to get anxious, for we knew that if he had been flying all the time his petrol must have been exhausted.

Mrs. Fellowes was with us at the aerodrome. She knew too much about flying for any of us to think of deluding her with specious assurances. Like the rest of us she feared that there had been a forced landing at high altitude and that rescue might prove a most difficult business. Her behaviour, however, was beyond all praise. Not only did she cling steadfastly to hope, but when the normal duration of the P.V.3 had been exceeded, she handled the situation in businesslike fashion. "If a message comes," she said, "it will be delivered at the bungalow," and she thereupon asked Clydesdale to fly her back. There they waited until, nearly two hours later, they were relieved to get the Air Commodore's telegram from Dinajpur. Clydesdale flew over in the Moth with pickets and covers, realizing that there was not enough daylight left to get the P.V.3 back that night, and the following morning Ellison flew a big load of petrol over in the Puss Moth. In the end there was nothing in the affair to get seriously disturbed about.

The reactions at home were vastly different. The first one came from the insurance people. We were informed that they regarded the flight over Kangchenjunga as the equivalent of the second Everest flight for which they had contracted to give us cover and that any further attempt on Everest would require a further premium of some £600. As the Wallace and both engines belonged to the Air Ministry, that seemed to us an unnecessary complication in an already difficult job, but, as we had not at that time been granted permission to make the second flight, we put the matter aside for consideration when the appropriate circumstances should

arise. It had, nevertheless, been made clear in Press messages that the failure of the survey on the first flight made a second attempt imperative and that we had applied for the necessary permission. So it happened that having received a telegram of congratulation from Lady Houston one day we received another of warning a day or two later. The story of the Kangchenjunga flight had been told in the interval.

The telegram which arrived from Lady Houston on 4th April was as follows: "Delighted to hear the glad news of your great victory over Everest. Send you my warmest congratulations and appreciation of your great achievement and of the pluck and courage you have shown. God bless you." Soon afterwards came the following message from Lady Houston: "The good spirit of the mountain has been kind to you and brought you success. Be content. Do not tempt the evil spirits of the mountain to bring disaster. Intuition tells me to warn you that there is danger if you linger." The wording of these telegrams would not have been published had the details not already been widely circulated in the press both in England and India. That was sent to Clydesdale personally and he took it at the time as another manifestation of Lady Houston's kind interest in his personal welfare such as had first made itself evident on his visit to her at Kinrara. But as soon as it was announced in *The Times* that Nepal had agreed to our making a second flight to Everest, other telegrams purporting to express the opinions and behests of Lady Houston and of the remainder of the committee at home began to reach us.

At first we were disinclined to take these seriously, because those members of the committee who formed part of the expedition in India had been formally constituted an executive committee before leaving London and given full power to take decisions and exercise authority on the spot. It therefore

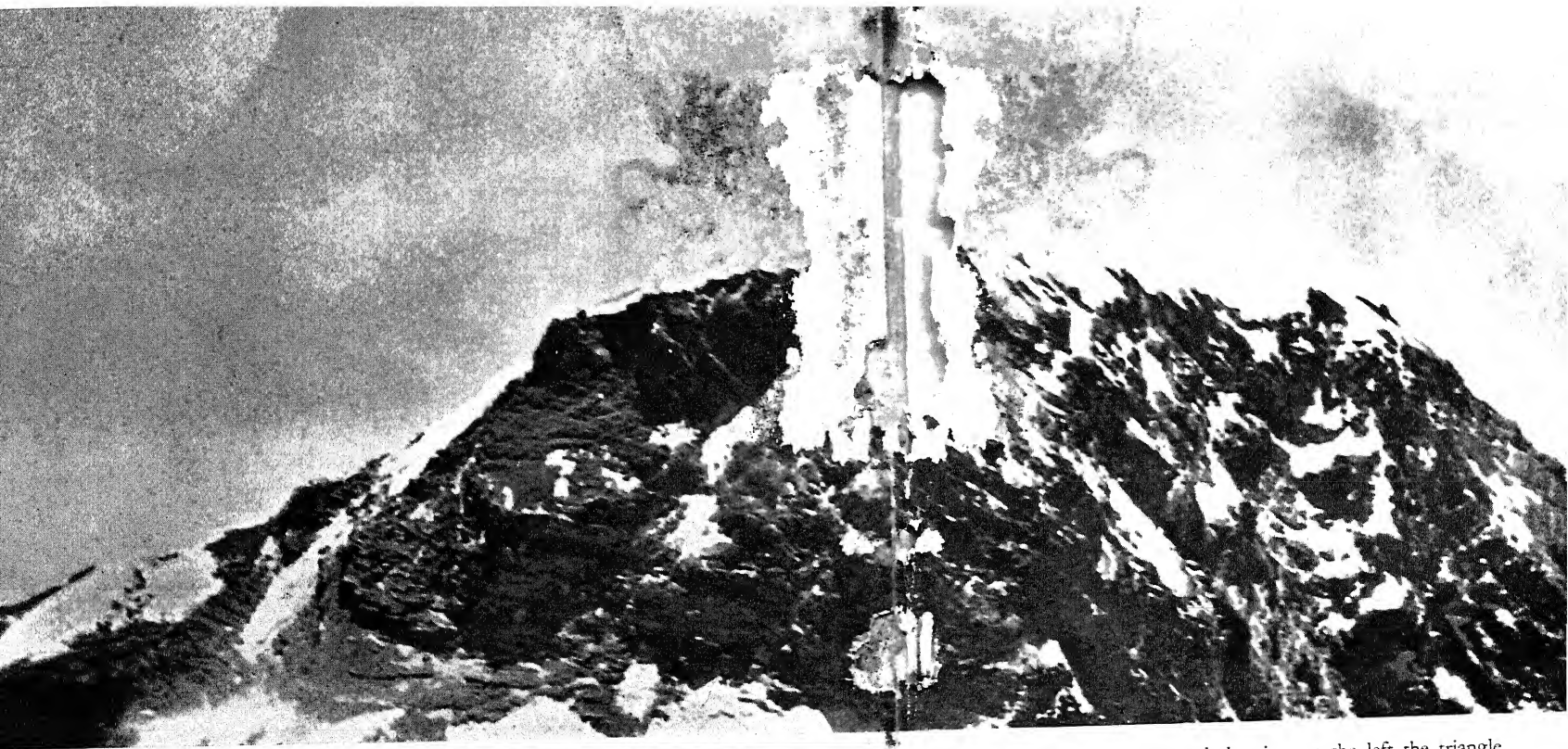
seemed unlikely that the full committee would attempt to resume its delegated authority and override the executive committee it had appointed at a time when that smaller body was in the best position to estimate the needs and risks of the expedition. Nevertheless, a stream of prohibitory telegrams began to arrive. The first required us not to move the aircraft from Purnea without first consulting the London headquarters. We interpreted that as marking the intention of the committee to rearrange insurance matters when the need should arrive. Later the telegrams made it quite clear that an attempt was to be made to prevent our starting on a second flight. We answered these with protest, argument and appeal. A spate of telegrams passed between us and the London headquarters. Our pleas were to no purpose. Our demands for information as to the source of the orders evoked no satisfactory reply.

The time came when the cables from home assumed the hectoring tone of responsible authority towards irresponsible rebels. One sent by a gentleman who was not even a member of the committee but was presumed to be acting as Lady Houston's representative for the time being, read as follows: "*Daily Mail* says second flight is to be made. Please explain. Machines uninsured. Nor will be." We demanded that the full committee should deal with the matter and were given to understand that the committee had decided against us. Again we protested uselessly until we were met with orders to pack up and return to England. Even then we tried to get the decision reversed, only to have the order repeated. At last there seemed no other string to pull. Everything had gone wrong. The weather for more than a week had been a succession of storms and gales. Had we desired to take the law into our own hands, the weather would have forbidden a flight to the mountains and, indeed, none of us

had contemplated such a thing while there was the faintest hope of wearing down the opposition at home.

The marching orders were evidently final. The Air Commodore accepted them with an ill grace and began to make plans for the packing and consigning of the gear. Then he fell ill with a nasty bout of fever and conspiracy took shape among his subordinates. Barkas and his film cameras never served as so good an excuse at any other time during the expedition. He was still clamouring for more mountain scenery. We took his demands most sympathetically to the Air Commodore and suggested one more high-altitude flight before packing up. The Air Commodore had never been able to resist the film men's demands. We encouraged him now to give way to them. He finally decided that he would be guilty of no breach of duty provided the aeroplanes were never out of gliding range of the plains. On that condition he approved the flight and the pilots bustled out of his bedroom lest he should attempt to extract promises from them. The point now was to get a patch of suitable weather and to interpret liberally the flying orders we had received from the Air Commodore. It was also desirable that we should make the flight before the Air Commodore was well enough to take charge of things on the aerodrome again.

The weather had improved a little. The thunderstorms had ceased, but there was a great deal of cloud and haze and the wind velocities must have been very great. We were denied the help of Mr. Gupta, who was still in hospital at this time, but the weather information we received gave no promise of easier winds such as we had met on our first flight. Clydesdale had already discussed the wind difficulties with one of the senior officers of the meteorological service who had visited us to arrange a relief for Mr. Gupta and had taken his advice concerning his own view that in any further



About to pass over the summit of Mount Everest (29,002 ft.), its Northern slopes blown clear of snow and showing on the left the triangle of snow which was shown foreshortened from the South on page 146 and straight on page 148, slightly foreshortened from the North-East on page 150, and now foreshortened from the North.

expedition a start should be made far to the west of Everest so that the aircraft might come down-wind over great stretches of the Himalaya range and land at some place a long way to the east. It was too late then for us to change the whole of our organization, but as time went on it became quite clear that we could not repeat the procedure of the first flight and go direct from Purnea to Everest because the high winds would so diminish our forward speed that petrol, and possibly oxygen, would be exhausted before the flight was finished.

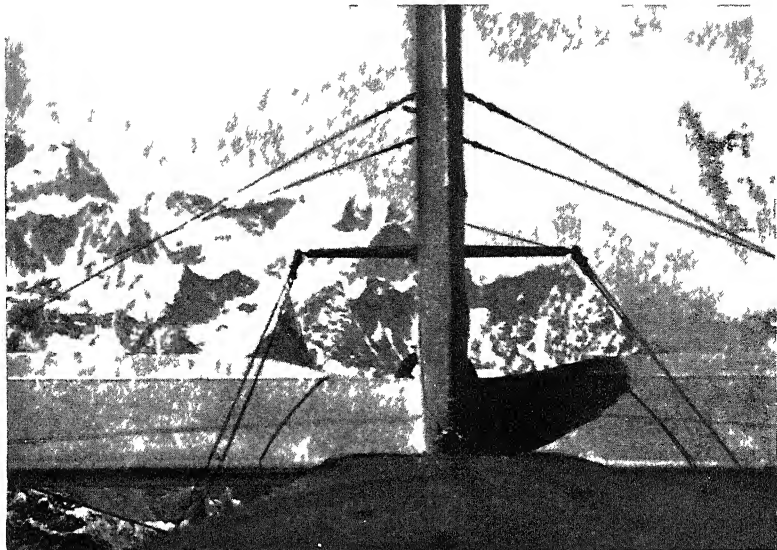
Thinking along these lines, another plan occurred to us. In this the central idea was to fly to a point well to the south-west of Everest at low altitude in the light and possibly favourable winds we might expect to find below 3,000 ft. and then to gain height as quickly as possible and come towards Everest with the high wind slightly helping us. Clydesdale laid the plan before M'Intyre and the details were carefully worked out. It seemed just possible, but we would have preferred to make certain on a trial flight. We were oppressed with the knowledge that there was only enough oxygen for one more long flight. If our new strategy should fail, we should not be able to make a further attempt. It was felt, nevertheless, that we should have to take the risk, but we resolved not to start using oxygen until necessary and not to press on with the flight if, when we came within sight of the mountains, the conditions looked impossible for survey work. While we waited for the weather to mend we checked and rechecked our calculations. Even in a high wind there seemed a fair chance of success.

If we were to avoid trouble and also keep the Air Commodore clear of any suspicion of complicity, it was necessary to get away while the Air Commodore was still in bed. He had been badly shaken by his attack and the doctor had tried unsuccessfully to persuade him to go to Darjeeling for a few

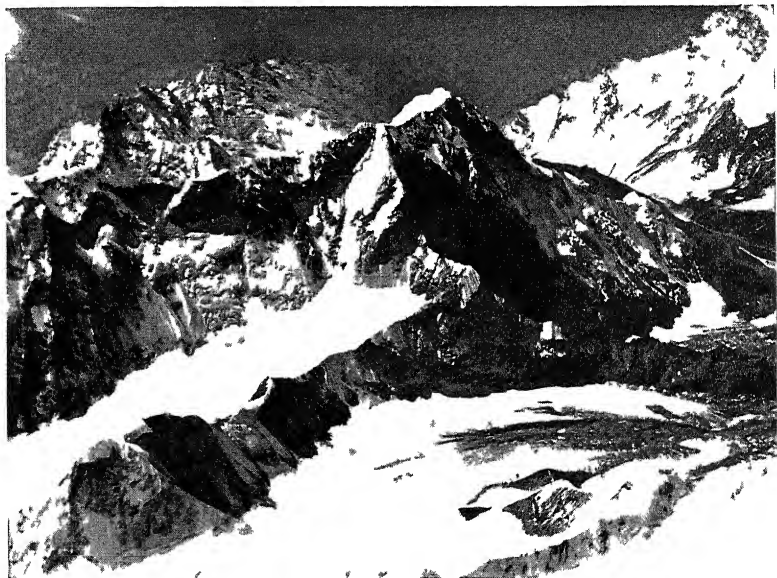
days of rest and recuperation. By 18th April he was clearly recovering, but the doctor, unconscious of the help he was giving our cause, insisted on his continuing to take life gently. That day, in our anxiety, we nearly broke out on our attempt though the wind strengths were above the highest we had allowed in our calculations and the sky was full of cloud. After a long conference we decided against it, though it was almost certain that only one more day remained to us. In a mood not far removed from desperation, we had the machines loaded up with oxygen that night and then over dinner we hinted to the doctor that he would be doing us, as well as the Air Commodore, a service if he could keep him in bed until lunch-time on the following day.

For ourselves the die had been cast. We were prepared to be adjudged insubordinate and to lift by our insubordination all responsibility and blame from the shoulders of the Air Commodore. Furthermore, it was felt that if we returned safely, very little could be done to us by the home authority whose orders it was our intention to defy. Those matters concerned us hardly at all on the morning of 19th April. Our minds were much more fully occupied with the implications of wind strengths. The meteorological officer had succeeded in watching a balloon to a height of 24,000 ft. and reported a north-westerly wind of 88 miles an hour at that height. Experience warned us that this might mean a speed of fully 110 miles an hour at our operational height of 34,000 ft.

The speed of the aeroplanes was 120 miles an hour. These circumstances made our new strategy the more important. On working out the calculations, quite a complicated business in themselves, it was eventually decided that it would be possible to go about 120 miles to the north-west before turning north and still have sufficient fuel and oxygen for the whole trip. The vital estimate in this scheme was that our climb on



A view of the mountains of Nepal over the tail-plane



Looking South at the highest point of the Chamlang
Range (24,012 ft)

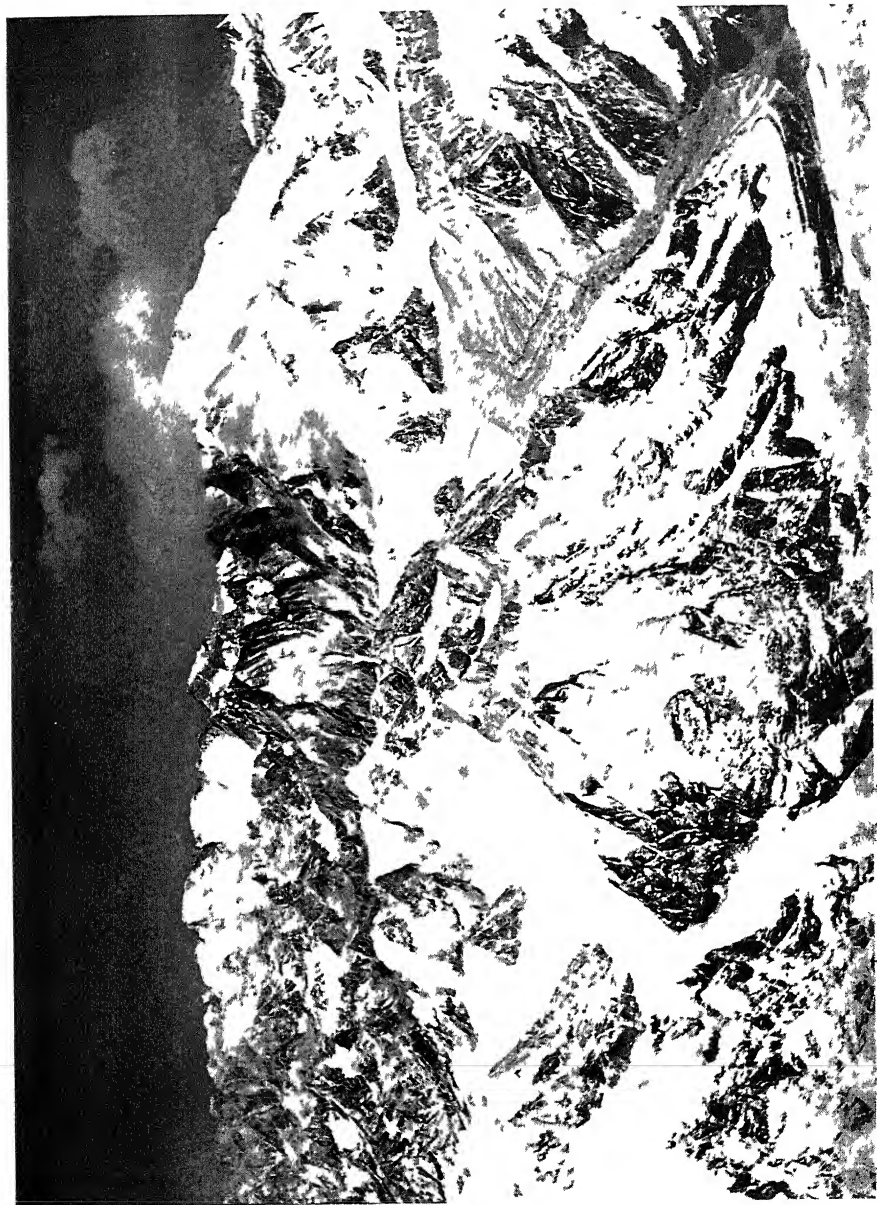
a northerly course would not be so prolonged as to allow the wind to have drifted us to the east of Everest either before the requisite height had been gained or before we had covered the 160 miles which would bring us abreast of the mountain.

The thing that particularly worried us that morning was the mass of clouds in the sky. The cloud base was low and it completely covered the sky. There could be no reconnaissance flight in the circumstances. Ellison was still a serving officer and it was impossible to drag him into our plot lest complaints should be made against him to the Air Ministry. There was nobody else to be sent up through the clouds who could tell us what the mountain country looked like. It was an accepted fact that on finishing the survey a return journey of fully 100 miles above the clouds would have to be faced before risking the danger of putting our noses through them in an endeavour to seek the plains. In the calculations we had made there was no margin for bad navigation and the prolonged search for our home aerodrome which that might entail. We had visions of coming down over those featureless plains of Bihar with perhaps 20 minutes' petrol left and nothing to tell us which way to turn for Lalbalu. For the moment that had to be put out of our minds. The immediate business was the outward course, the figures concerning which were written in very big figures on our journey cards against the risk of what M'Intyre had called "high altitude baby-mindedness."

At dawn we slid quietly out of the bungalow, leaving the Air Commodore still in bed. As few as possible had been taken into our confidence. Shepherd was one of them. He had agreed with some reluctance to keep the story a secret as long as there was no serious risk of its leaking out among his competitors. We had no desire whatever to share the tale of that flight with the rest of the world. One thing alone

concerned us and that was the completion of the survey. If that could have been done quietly and unobserved, we should have been quite content. Our hope was that it would be possible to get two full sets of vertical photographs covering the uncharted ground south of Everest and that these should be handed over to the map-makers of the Indian Ordnance Survey and of the authorities at home. If the work could be done in that way, we should avoid a quarrel with our own committee, at least until feelings were less heated, and yet should have performed the principal task of the expedition. Blacker, as Clydesdale's observer, was deep in the plot and Fisher, who had been allotted Bonnett's place in the Wallace, knew what we hoped to do. The rest may have drawn their own deductions but they had been told nothing definite.

Preparations were already well advanced when we reached the aerodrome and began installing the vertical cameras. M'Intyre had treated his camera, since its failure on the first flight, as his most precious treasure. He had taken it to pieces, cleaned and adjusted it and satisfied himself that every detail was in order. Then he had tested it in the aeroplane and it worked. Believing that its delicate mechanism had been upset by the bumping in the motor-car between bungalow and aerodrome, he refused to have it rattled any more over those dusty roads and took out to the aerodrome his uniform trunk, a long steel box which is guaranteed proof against dust and vermin. Wrapped in silk and paper, the camera was stored in that trunk and M'Intyre would allow no one but himself to touch it. Not only did he install it in the Wallace that morning but he set the approximate drift reading and switched on the main controls before leaving the ground so that there should be no occasion for his observer to do anything to it at any time during the flight. This personal care was justified by the results, for it was this camera



View of the unknown glacier from the Everest Group and Makalu taken on the return of the expedition to the plains of Tibet.

which produced the only complete and unbroken strip of the country over which we flew and M'Intyre, to whom the survey was the only thing that mattered, went home a fortnight later a contented man.

This time there was no final conference as to whether conditions were fit for the attempt or not. We believed this would be our last chance; we had received our weather report and had worked out our course in the light of its details. All that remained was to do our part as well as we might and hope that success would be ours.

CHAPTER IX

THE SECOND FLIGHT

(a) *Flight of the Houston*

(*Clydesdale*)

By a quarter to eight all was ready. A final check-over and the engines were opened out. At 7.50 we were off the ground and, wasting no time, laid a direct course towards the north-west, making for Chibutar at the junction of the Sun Kosi and the Moianing Khola, which had been selected as our turning point. That point lies well to the south-west of Everest. We hoped to reach it in about an hour and then to go up into the strong westerly winds of higher altitude with a better chance of combating drift than would be possible if the direct northerly course from Purnea had been chosen. As had been hoped, a light easterly wind was found at low height. The sky was completely overcast and we slid along down-wind for the first 50 miles at a height of only 2,000 ft.

When we had crossed the Kosi, the main river of that name, near Anchra Ghat, a few gaps began to appear in the cloud-layer above us. Not yet being able to see the foothills, I recognized the risk of our being unable to see Chibutar if we went above the clouds, but on the whole it seemed preferable to get above the clouds without going through them. I considered that if we climbed through them we should run the bigger risk of collecting ice on our aircraft which might reduce our ceiling to something below the height of the mountain, so I selected the biggest gap and started the climb. The tremendous depth of this layer of cloud soon revealed itself. Behind us and on our right was the towering white wall of

woolly cloud and ahead of us were its companions. As we climbed, nothing directly ahead or behind could be observed; we had only the patch of the plains beneath us, but this was useful as a means of checking our drift as we made our way into the upper air-currents.

The clouds were very much deeper than I had expected. The altimeter showed 18,000 ft. before coming out over the top of them, but once clear of them we had the finest sight of the whole expedition. For a distance of about 80 miles the sea of almost unbroken cloud stretched to the line of the mountains. The white cloud-tops seen in the sunshine billowed away into the distance like cotton-wool packing out of which the still brighter white of the ice cliffs raised its ultimate challenge to the sky and gave it a peculiarly deep shade of blue. There was none of the gloom of the drab dust-haze about this prospect. Cloud and mountain cast back the glare of the sun towards the sky and we found ourselves in a world not only of brilliant reflections and high lights but of marvellously clear visibility. Kangchenjunga was far away but Everest and Makalu stood out as the dominating features of a vast mountain landscape and looked absolutely colossal. I have since seen something faintly reminiscent of the sight in flying over cloud from Basle to the Engadine, where snow-peaks pushed their way up out of the apparently solid vapour, but never have I found a scene set on such a scale. Once again we could see far beyond the mountains which were our aim, and again the picture produced a definitely intoxicating effect.

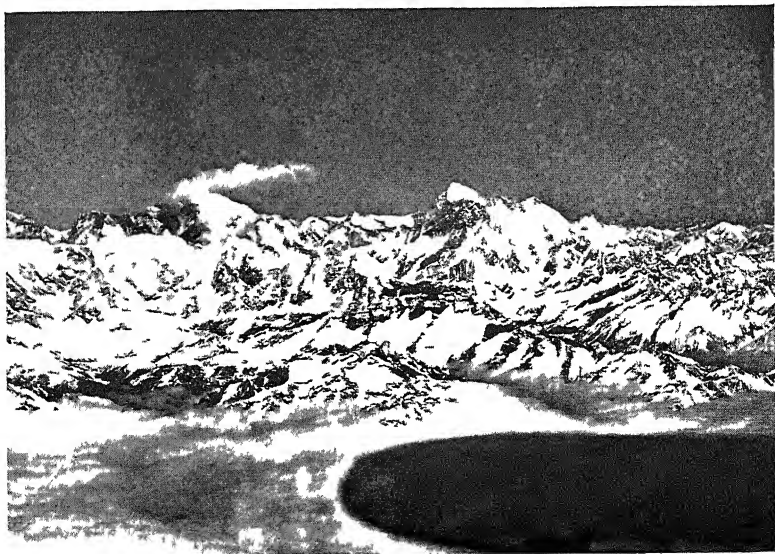
So far oxygen had not been required. It had been part of our plan to do without oxygen until it was almost certain that the flight could be completed with some chance of getting vertical photographs of the southern slopes of Everest. The decision had now to be made and I was disappointed at the

discovery that the foothills and much of the country above the snow line were covered with this thick layer of cloud. From what we could see at that range it appeared possible that we might be able to photograph the last 20 miles of the flight. That would take in a big piece of the comparatively unknown territory and I decided it would be worth while. Accordingly our rate of climb was increased and our course laid well to the west of the mountain. When the height, as shown on the altimeter, was 21,000 ft., we turned on the oxygen. It seemed reasonable at last to go on with the flight and so to use the last of the oxygen. We went on climbing as fast as possible, making good headway the while towards the mountain, but finding, as we climbed, that the terrific strength of the wind still threatened our plan to come over Everest on its west side.

Several times I altered course slightly more to the west and then one of those disturbing little incidents occurred, small in itself but unpleasantly worrying at high altitude in a fierce beam wind. Looking over my apparatus, I suddenly noticed that the heater plug of my oxygen system had fallen out of its socket. This was a matter of slight significance unless moisture should have happened to collect in the system, in which case the water might be expected soon to freeze in the valve which delivered oxygen to the mask. I put the plug back into its socket and found it would not stay there. Using the telephone, which fortunately was working well on this flight, I explained the trouble to Blacker. He handed me a screw-driver with which I opened out the two legs of the plug and so at last got it to make good contact. At about this time M'Intyre had moved over from my right side to my left to enable Fisher to get a film of the leading machine with Everest as a background little more than 12 miles away. While busying myself with



Retreating from Everest with the Chumling Range
(4 000 ft average height) in middle distance



Everest and Makalu taken over the tail plane when
machines were heading South over the cloud layer
back to the base camp

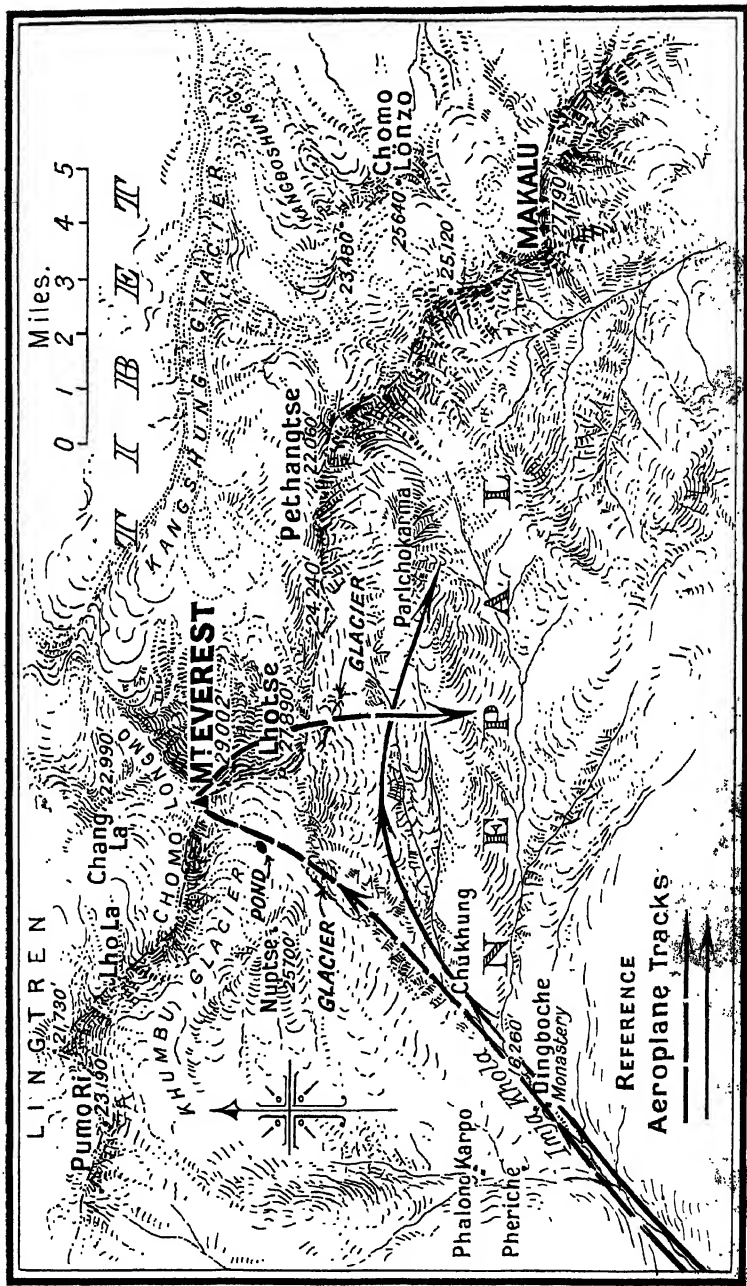
the troublesome plug, I suppose I must have concentrated less on combating drift, with the result that the two machines tended to diverge and it was more and more difficult to beat back towards the west in the face of the hurricane.

We had come out clear of the cloud bed at a distance of about 20 miles from Everest and at a height of more than 31,000 ft., and had at once switched on the electrical controls of the survey cameras, timed to make an exposure automatically every 15 seconds of whatever happened to be directly beneath. The question of drift now became of first importance. We were still climbing and our forward speed was therefore reduced and I wondered what sort of survey strip we should get if the rate of drift should exceed the forward speed. I found I could not work out that sum at that height, particularly as it was complicated by the fact that we were only about 5,000 or 6,000 ft. above the snow country. To my eye the drift appeared far greater than anything I had ever experienced before. The snowfields, so comparatively close, were slipping away sideways at a furious rate, and although the vertical camera had been set going, I could not resist the temptation to turn dead into wind. Then I found the machine seemed to make no progress whatever. It just hovered stationary until I turned back on my course.

The plume of Everest confirmed this impression of high wind velocity. It streamed horizontally away to the east like the steam of a giant railway engine. It was longer and thicker than I had ever seen it before. At the most moderate estimate it could not have been less than six miles in length. In the position from which it was best viewed, there was a ready-made yardstick by which to measure it. The distance between Everest and Makalu is 12 miles and on flying northwards over the last few miles of the flight I could see that the plume covered more than half the distance. I had had a fine

view of Chamlang on my starboard beam and had got up to 34,000 ft. before realizing that, in consequence of flying by sight rather than by compass, I had made the error of not keeping a big enough angle between course and track. My chances of coming out, as was intended, well to the west of Everest, were dwindling in the furious wind. Nevertheless I persisted until it became quite clear that the only possible course would take me into the plume before getting over the summit. In other words, I should again approach Everest slightly on its lee side and the memories were still fresh of that first occasion when we had met curious conditions in the lee of the mountain. The principal difference between the two occasions was that the wind this time was about twice the strength of the wind on the previous flight.

In any case we had decided not to cross the summit on this occasion, but to confine ourselves to a vertical survey of the country south of Everest—a formal concession to the anxious people at home and a scrupulous regard for the rights of Tibet which had not accorded us any sort of permit. I therefore carried on with my flight, hoping the camera was working properly, until within approximately three and a half miles from the summit and at that point I felt it was advisable to turn away. As M'Intyre wrote afterwards: "When the leading machine suddenly turned to the right, it slipped away down-wind in an incredibly short space of time and it seemed only a few seconds before it was a tiny black speck away beyond Makalu." I increased the rate of the vertical camera as our ground speed increased and headed for Makalu with the object of getting a good series of overlapping photographs connecting the southern face of Everest with the actual summit of Makalu. Having passed over that peak I made another turn to the right and flew for a short time towards Chamlang. Then I turned right again and pointed the nose directly



Map showing route followed by aircraft on the second flight

towards Everest. Once more we were meeting the full force of the hurricane and the machine seemed to be making no headway. Blacker declared afterwards that we were being blown backwards by the wind at this time but I think that was an illusion.

M'Intyre was not visible to me in the immensity of that landscape. He might have been in the plume or away on the far side of it. It was impossible to tell, and as the film in my survey camera was exhausted, it was obvious that I could be of no more service on that side of the affair. After a brief battle with the fierce wind, I turned once more over Chamlang and made for the Arun valley. I decided to fly over the clouds on a compass course for about an hour, and if no ground was visible at the end of that time, to come down through the clouds, for I felt certain that by then we should be over the plains. This plan was carried out and it worked well. On coming down beneath the clouds, I found a good course had been made. I was not far from Forbesganj and circled the landing ground to make sure that M'Intyre had not landed there. There was no sign of him and I went on to Purnea. The flight had taken me three and a half hours, and M'Intyre landed at Lalbalu a quarter of an hour after myself. I then found that, if he had not actually been inside the plume, he had been over it and had met one of the most violent bumps he had ever known.

The story is best told in his own words.

(b) *Flight of the Wallace*

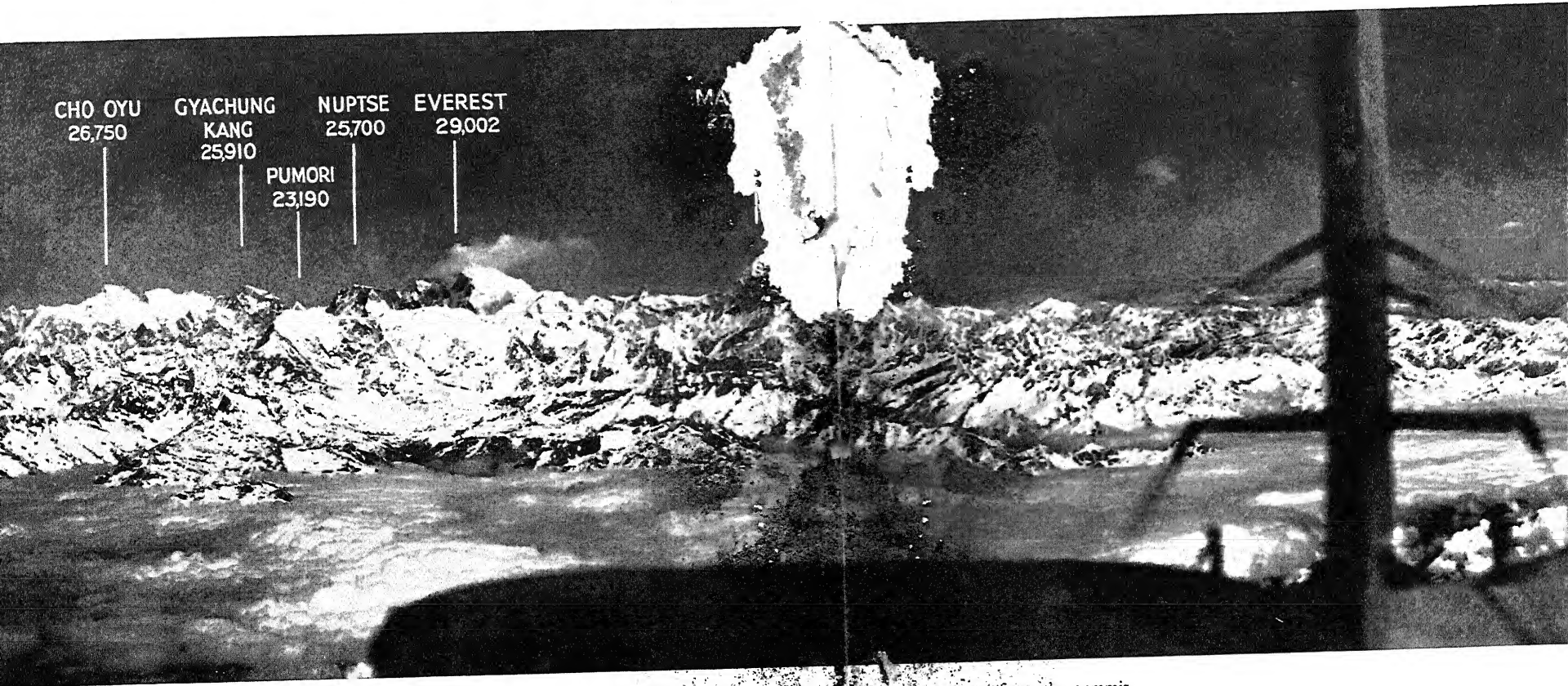
(M'Intyre)

I soon found after moving over to the left of the Houston to give Fisher a picture of it with Everest in the background, that the course had to be laid more and more to the left so

as to avoid being carried to the down-wind side of the mountain. Once there it would have been impossible to fight our way back. I had edged away a good deal, not quite easy in my mind as to whether my job was to follow my leader or to make an accurate course for the mountain, when I saw him turn away to the right. That forced me to a decision and I promptly set the nose still more to the left. I was still on the safe side of Everest as a glance away from the instruments showed me, though progress was terribly slow and we seemed to go on losing ground to the right. There on my right front was the enormous pinnacle, the bright morning sun glinting on the frozen snow and throwing into strong relief the great rock faces, some of them a sheer 8,000 ft. or more.

The next 15 minutes was a grim struggle. The altimeter showed 34,000 ft. The menacing peak with its enormous plume whirling and streaking away to the south-east at 120 miles an hour, appeared to be almost underneath us but refused to get right beneath. After what seemed an interminable time, it disappeared below the nose of the aircraft. I determined to hold the compass course until I gauged we were just over the mountain. Petrol was getting low and I knew there would not be sufficient to go beyond. We appeared to be stationary. I cast quick, anxious glances behind and below to see if we had passed over. Then suddenly there was a terrific bump—just one terrific impact such as one might receive flying low over an explosive factory as it blew up.

We were thankful for the marvellous strength of our Westland aeroplane. It felt as if the wings should break off at the roots, but there was no nasty cracking noise such as would have denoted structural failure. A hurried look round showed every wire taut. There was no sign of slackness anywhere. The bump was a relief in a way, as it indicated the



A stretch of the Himalayan peaks as viewed on our return from the summit

summit and was the signal for a careful, gentle turn to the right to settle down on our predetermined compass course for home. I had grave doubts that insufficient allowance had been made in working out this homeward course for the wind, but knowing how incapable the mind is of rational reasoning at high altitudes, decided not to alter it.

As we came abreast the precipitous west side of Makalu that had given us such a frightening time on the first flight, we came to the end of our survey film. We slipped past Chamlang with its many glacier beds and faced the seemingly endless sea of cloud. Losing height gradually until we were brushing over the billowy cloud mass, we hung on steadily to our course, wondering if we would be able to recognize our position on coming to the end of it. Unfortunately we came out on featureless country with nothing to recognize but sandy scrub-covered hills and dry river beds.

I tried to check up my drift, found I was steering too much to the right, altered course 5 degrees left and decided to hold that course until I either recognized my position or got down to the last five gallons of fuel. We came to a winding, muddy river which I felt certain must be the Kosi, but as the rivers in this part of India have been known to change their tracks by as much as 30 miles from year to year, I did not allow it to affect the set course. A tiny village appeared ahead and to my relief I recognized it as Darara, a village I had passed over in a tropical thunderstorm on my way back from Darbhanga a few days before. This made us about 15 miles west of Lalbalu and we joyfully turned east and flew low back to the aerodrome, to find that the leading machine had landed some 15 minutes before us.

(c) Aftermath

Back once more at the aerodrome, our immediate concern was to find out whether the play had been worth the candle or not. There were two big rolls of survey film to be developed and an anxious Air Commodore to be appeased and whatever must be done had to be disguised as much as possible, for we were still set on avoiding publicity if possible, with the object of postponing the argument which seemed inevitable. Of course, we had aroused the suspicions of the mechanics and aircraftmen; and the fact of our having been away from the aerodrome for three hours had attracted a party of local residents to Lalbalu. The story that we had been away on cinema work might or might not serve. It was half true and it was the only explanation we could use. The Air Commodore had formed his own conclusions before we got back and the party safely landed, he probably did not mind much.

He had reached the aerodrome about an hour and a half after we took off and was surprised to find we had not got back. For half an hour he waited patiently and then, beginning to get worried, he started inquiring. Within a few minutes he had found out that the machines had left with full tanks, with oxygen and with vertical cameras. He then realized what had happened and during the next hour he must have suffered some of the anxieties which we had known on that afternoon a fortnight earlier when he had been missing over Kangchenjunga. He was the officer responsible to the committee for the safety of men and machines as well as for the due and proper management of the expedition. Until the aeroplanes returned the possibility of failure in all these duties lay before him. We had tried not to be callous. If we could have kept him in bed the whole of that day it would have been

done, but he took his responsibilities too seriously to remain off duty when he began to feel better and the doctor had been unable to persuade him to stay in his room for another day. When, finally, he had got us all safely on the ground again, his relief almost overcame his resentment.

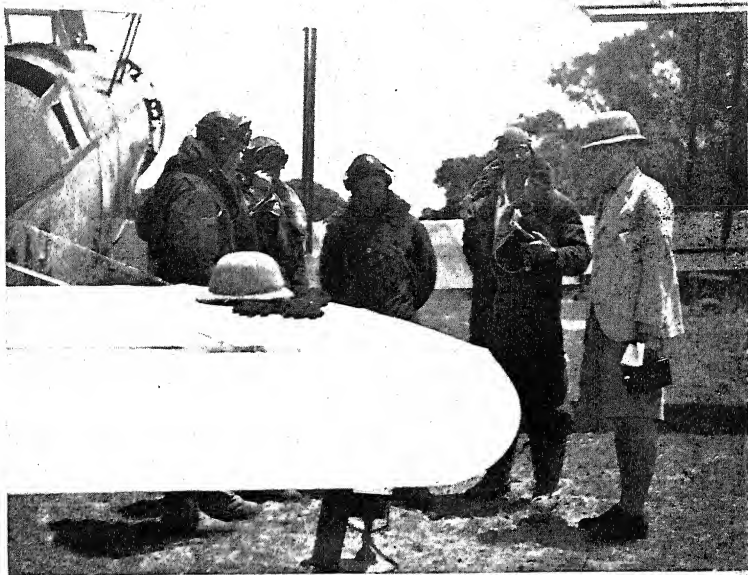
In the quarter of an hour that elapsed between the two landings, he had learned briefly from Clydesdale what had been done and how the pilots were hoping still to keep the whole matter a secret. This, again, was a source of trouble to him. His way had always been the forthright way, except once, perhaps, when as a wing commander in the R.N.A.S. he went off to do a low-bombing job on the dock gates at Zeebrugge which he preferred not to ask a junior officer to do; and he disliked the suggestion that we might with advantage leave the rest of the world in the dark for the present. The best that could be got out of him was a promise to delay his report until the morrow, by which time we might be able to say whether the survey photographs were good or bad. Shepherd's promise of silence was also conditional. He had arranged to inform his office by means of a code telegram of the second flight and to ask that publication be delayed. He had stipulated for freedom to tell the whole tale if the fact of the flight should leak out in any of the other newspapers.

The run of events eased the situation for both the Air Commodore and Shepherd. Notwithstanding all our precautions, the news reached London and was published in some newspapers the following day. That brought things out into the open and the Air Commodore's report was cabled home. The pilots were fully satisfied. Until late on the night of the flight Blacker and Aircraftman Fraser had worked in the darkroom developing the survey films. It was slow work, for every lot of developer and every bath had to be brought down

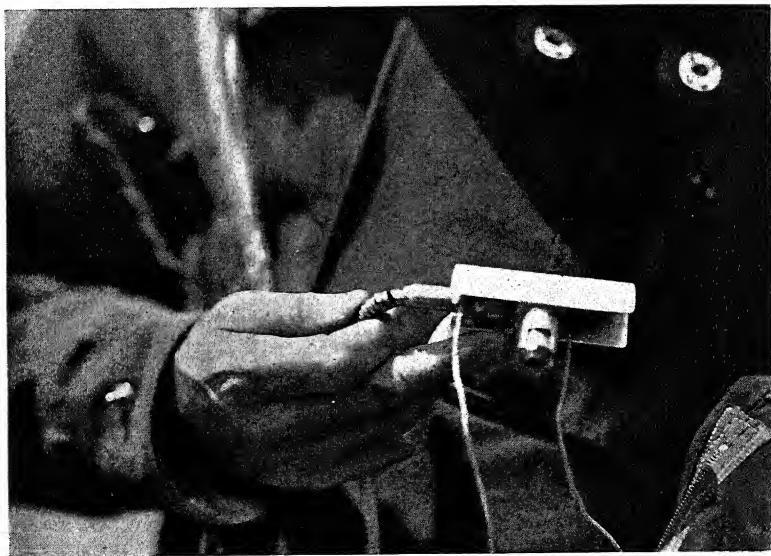
to a proper temperature by the addition of ice, so that no harm should come to our precious films in the processes. At last we knew that the cameras had worked well during the flight and that there were two good survey strips of the south-side of Everest and of the mountain country between it and Makalu.

Our job was done, however much the method of doing it might be disapproved or criticized. We were willing enough to help with the packing and set the bullock carts lumbering along the road towards the railway station again. For the first time since landing with the whole caravan at Purnea, the weight of anxiety was lifted and we could take the modest pleasures which the place offered with easy minds. One of our first thoughts was to return some of the hospitality we had received and our plan of a tea party and flying display in the grounds of the bungalow proved both popular and successful. In readiness for that occasion we made prints of all the negatives taken on the two flights and laid them out for the benefit of the visitors. We even printed the vertical survey photographs before the films were packed up and sent home by Imperial Airways for the attention of the map-making department of the War Office, and these prints were laid out in strips, still wet. They were spoiled by the dust which the party raised, but that mattered little. They probably meant little to our guests, although M'Intyre, in his enthusiasm, filled the part of interpreter with devotion and clarity; but our visitors were flattered at being given the first view of our results and we owed them much more than that.

The party began to break up almost at once. Blacker and Etherton were persuaded to go for a few days to Darjeeling in order to help Barkas make a few more hundred feet of film. As we no longer had the Fox Moth which Clydesdale had flown to India, he decided to return by boat after deliver-



Crews reporting results of the flight to Air Commodore
Fellowes on landing at Lalbalu



Bonnett's fractured oxygen feed pipe

ing the Houston to Karachi for reshipment. Hughes, the ground engineer, was packed off to Calcutta to catch a boat for home. Little more than a month after our arrival at Purnea, Clydesdale and Ellison started the journey back to Karachi with the two big machines. M'Intyre stayed behind to finish despatching the stores and to await Etherton with whom he had arranged to make a short tour of certain native States before starting the homeward flight. The Air Commodore and Mrs. Fellowes had promised to accompany them in the Puss Moth. Blacker was to get back as quickly as he could and booked a seat in the next homeward-bound Dutch machine. We were all sorry to separate, but had already booked our reunion, for *The Times* had cabled its intention to give a luncheon to welcome us home.

The other members of the party took off from Purnea on a fine morning with two passengers in either machine. This time Clydesdale flew the Wallace. Ellison took the Houston. The passengers were Shepherd, who was to leave us at Delhi to travel to Simla and then to spend a week with the R.A.F. on the North-West Frontier; Pitt and Barnard, the two engineers, and an aircraftman. As these left Lalbalu, M'Intyre was busy with the Moth, giving joy-rides to all those members of the party who had not seen Everest. It was a fine morning with only 2,000 or 3,000 ft. of haze and, once above that, there was a magnificent view of the mountains. Those in the big machines took their last look at them as the course was laid at a height of about 7,000 ft. for Patna and Benares and Allahabad. We came into Delhi in the late afternoon with two engineers who were very glad to be on the ground for a few hours. In the heat of the day the bumps had been fairly heavy and continuous; it seemed a little ironical that the two men who had not spared themselves in keeping engines and aircraft fit for their work,

should be given so trying a trip in the machines they had nursed.

Next day the machines went on to Jodhpur and there the chance to render a small service occurred. At that time the Imperial Airways terminus was at Karachi and the air mail was taken from Delhi to Karachi by a Moth belonging to the Delhi Flying Club. On the day that the expedition's machines left Delhi, the Moth had set out ahead of them and, before it could make Jodhpur, had been damaged by a kite which collided with it. A wing strut had been broken and the pilot had to make a forced landing and await help. During the night the mail was brought in to Jodhpur and Clydesdale's offer to carry it on to Karachi was accepted. The load was duly delivered to the postal officials at Drigh Road next day and, just as Clydesdale was about to leave for Bombay to sail for home, there arrived a telegram from the president of the Delhi Flying Club saying: "We are very grateful to you for your timely help in carrying air mail Karachi." We also much appreciated a telegram of thanks from the Director of Civil Aviation in India.

That was the end of the flying in India. The others, who brought the smaller machines home, enjoyed themselves on the greater part of the journey. Flying across India, the Air Commodore and M'Intyre got into a very bad thunderstorm which might easily have wrecked them. M'Intyre landed and sheltered his machine behind a wall. The Air Commodore tried to get above the storm and then tried to get round it and ultimately went straight through it. He had a very rough time.

At Udaipur, Air Commodore Fellowes, Mrs. Fellowes, Etherton and M'Intyre paid visits to several native potentates, one of whom invited them to an exhibition of tiger and pig fights which was specially arranged in their honour. Set in

the middle of the forests, there was an arena encircled by what looked like a vast castle, and here it was that these combats were held. A wild pig, chosen for his size and ferocity, is singled out and enticed into captivity, after they have obtained a tiger by means of a trap or pit. Then carnival is proclaimed, the lists declared open, and the two protagonists, tiger and pig, set at one another in the arena. A Homeric combat ensues, and strange as it may seem, the pig nearly always brings off the victory. Perhaps it is that the tusk is greater than the tooth.

At Dholpur, we were all very kindly invited to stay with the Maharajah, but remembering the experience at Allahabad where havoc had been done to the Fox Moth in the gale, M'Intyre, noticing the stormy appearance of the sky, decided to forgo the comforts and pleasures of the palace for the night and to spend it with the aeroplanes. The machines were tied down near a sentry box in an open stretch of country which the Maharajah had, with customary Eastern munificence, placed at our disposal. M'Intyre made a bed for himself on the top of this sentry box, and, despite the stormy portents, managed to pass quite a comfortable night. In the early hours of the morning he was awakened by a strange flapping noise about his head, and on opening his eyes was surprised to see a stream of birds at least a quarter of a mile in width above him. At first, he could not understand what was happening, but at last realized that all the birds in the vicinity of a nearby tropical storm were flying out of its track. The stream continued to pass for about half an hour, gradually decreasing in width until only poor old mangy birds straggled past, barely able to fly. The logical conclusion would have been for these to have been followed by their more aged and decrepit brethren who could not even fly and who should by rights have been helping and supporting each other as they stumbled along!

The storm must have been somewhere in the north as it happily did not reach us.

From Karachi, Ellison took Etherton's place in the Moth and the two machines made an easy and comfortable journey to England by the shorter route through Central Europe. Less than a month after we broke up, most of us were in England again, meeting from time to time at this celebration or that and gradually settling down again to the more prosaic work of our choice.

Some estimate of the fruits of our endeavours in India is attempted hereafter. Our expedition was concerned particularly with the science of flight, of geography and exploration. We have been able to contribute nothing to the knowledge of the mysticism of India in which the Himalayas play so large a part. Yet no man can come close to the great peaks without acknowledging a sense of awe, and understanding something of the fascination they hold. It is so much the easier to appreciate the Hindu beliefs that these mountains are the sacred places of the gods and the source and inspiration of true life throughout India. The waters of the Ganges are counted holy because they come direct from these mighty mountains and it is held a greater virtue to have seen them than to have performed many rites of worship. They are perhaps the greatest phenomena the earth can boast and their influence in India is so pervading in the material sphere that they may naturally enough have assumed a dominating position in affairs of the spirit.

It would have been good to have made the flight to Everest at dawn and at sunset. We saw the mountain on both occasions in high sunshine when there were few shadows to shroud her mystery. In softer lights one might expect to feel something of the romance of these enormous masses of rock and ice, and of the spirits which stir them and account for



Vertical photograph taken on approach towards Everest showing the hot lake, previously uncharted, which can be seen as a black irregularity near the centre of the picture

(Reproduced by kind permission of the War Office.)

their moods. Our duty did not lie along those lines but the great mountains demanded our attention and respect. We could take no liberties with Everest and the most sensitive devotee could take no exception to our treatment of this vast, natural shrine.

CHAPTER X

THE RESULTS

It may be well to insist once more on the incompleteness of the survey work which we could hope to do in the course of this expedition. Even if we had succeeded in making survey strips on both flights, we could not have covered the whole of that part of the mountain region south of Everest which is virtually unmapped. We acknowledged our limitations from the start and clearly defined our aims. We desired to satisfy ourselves that air photography for map-making purposes could be used over rapidly rising country; we sought to discover the peculiar conditions attaching to air survey over the highest point on the world's surface; and we hoped to bring back specimen strips which would show some of the physical features of the southern face of Everest, inaccessible to surveying parties on the ground.

In these three aims we succeeded. We had not hoped to do more and, if the situation is examined, it will be seen that a fuller and more comprehensive survey was out of the question. In the first place our aeroplanes could not be expected to operate with reasonable efficiency much above 35,000 ft. That could allow only 6,000 ft. between the lenses of our survey cameras and the highest points they were required to photograph and so limited the area of ground which could be photographed at one exposure. In the second place, we had only a single permit to fly over Everest at the start and, threatened with the forerunners of the monsoon, could not wait indefinitely for the perfect conditions which would have given us the best results within our limited scope. That meant that we had to take some risk as to visibility which might affect the flying of a true and steady survey course, and as to

wind strengths which might add the complication of drift to that of securing adequate overlaps. Finally, we had to be content with 125 photographs on each roll of film, for it seemed unlikely that the survey cameras could be safely reloaded in the air. That fact compelled us to economize in film, and take the chance in the early stages of the survey of allowing too small an overlap.

Eventually, it was found impossible to be sure of an operational height of 35,000 ft. and we made our arrangements on the assumption that we should be flying at 33,000 ft. We had intended to use the river junction of Komaltar as the start and control point of the survey. Passing over that point at a height of 33,000 ft. the Eagle camera would have photographed a square of ground with sides measuring about 28,000 ft., but as the ground rose steeply towards Everest, the area photographed from the same altitude would become less and less until near the summit every exposure would record an area measuring only about 4,000 ft. square. This raised the difficult question of adjusting the intervals between exposures so that there should be the full 50 per cent. overlap to supply the necessary identification checks on successive photographs. It also meant the narrowing of the survey at its most interesting point to such an extent that seven or eight trips would have had to be made on parallel courses to and from the Everest region in order to obtain a full survey of the southern face.

The desirable overlap is that which shows common ground in every three successive photographs. It must therefore be more than 50 per cent. and in order to make allowance for bumps and tilt it is wise to aim at a 60 per cent. overlap (see figure 1 on next page). A strip which does not give common points on every three succeeding exposures is of little use for map-making. Its continuity is broken and, although a tie-up

can usually be made, there is bound to be a gap in the detail, obtained from aerial photographs by the stereoscopic examination of two photographs of the same feature from slightly different positions above it. The overlapping was important

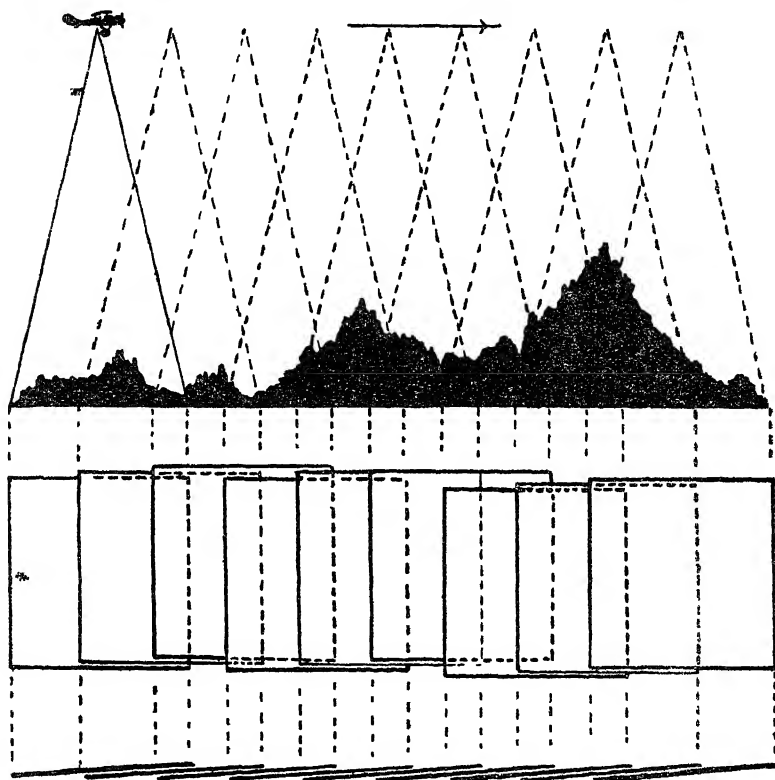


Fig. 1—Showing 60 per cent. overlap

but, with our limited supply of film, difficult. We eventually decided on a compromise. We divided the flight from Komaltar to Everest into three zones in each of which a particular interval between exposures was to be maintained (see figure 2). In determining the intervals we presumed the highest piece of land in each zone to be the average height of

that zone and fixed the intervals to give us the requisite overlap. Then we estimated the time that would be needed to fly across each zone at various ground speeds and from that we made a circular scale to show at a glance the intervals to be set and the periods during which they might be continued without alteration.

Figure 3 represents the circular scale we proposed using. It consisted of two superimposed discs of gun-metal rotating about a common axis. On the upper disc four apertures were cut, through which could be seen the variable scale on the lower disc; these scales, as we have said, were determined before attempting the flights. In the top aperture was fixed the ground speed which, of course, would naturally be different from the computed air speed of our instruments.

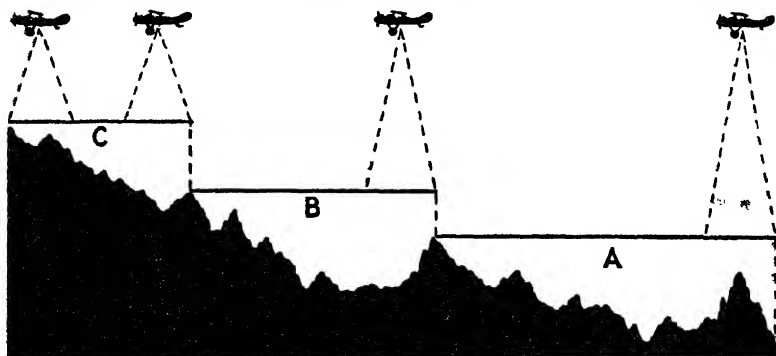


Fig. 2—Showing the three zones

Ground speed is the speed of the aircraft relative to the ground and is subject to the air speed of the aircraft and the velocity and direction of the wind, and consequently, although we knew that we would be flying at a settled height and a definite air speed, we were unaware of the actual ground speed we would make good: this could only be determined after leaving the ground and then only by timing and checking the angle of

drift. As it turned out, we found it impossible to obtain an accurate ground speed on account of poor visibility beneath us.

The second aperture contained the time interval in seconds required in the three zones A, B and C, as seen in figure 2.

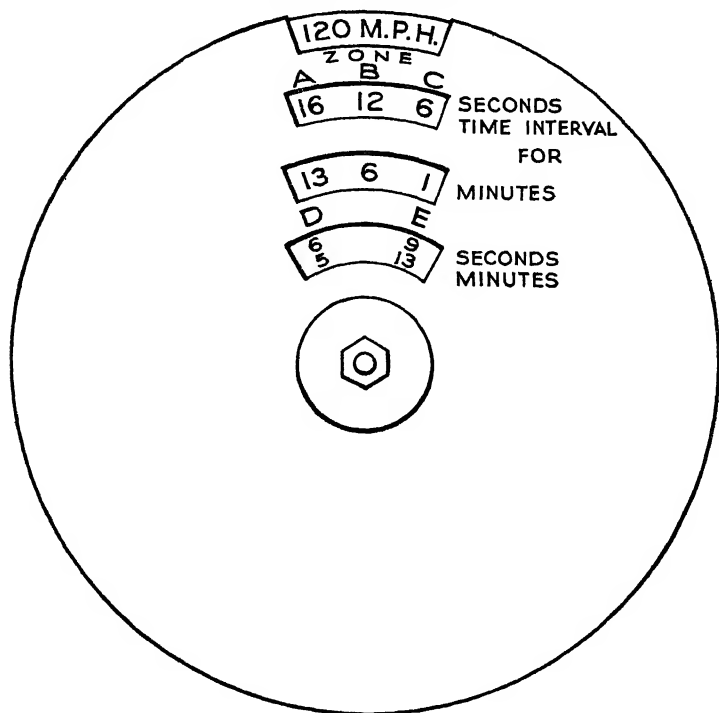


Fig. 3

It will be noticed that at each zone the average time interval varies considerably, in the case illustrated at the rate of 16, 12 and 6 seconds. The third aperture contained the time in minutes which we required to cover the respective zones; for instance, it was necessary for us to fly for 13 minutes at a ground speed of 120 m.p.h., exposing plates every 16 seconds over Zone A, 6 minutes flying with exposures every

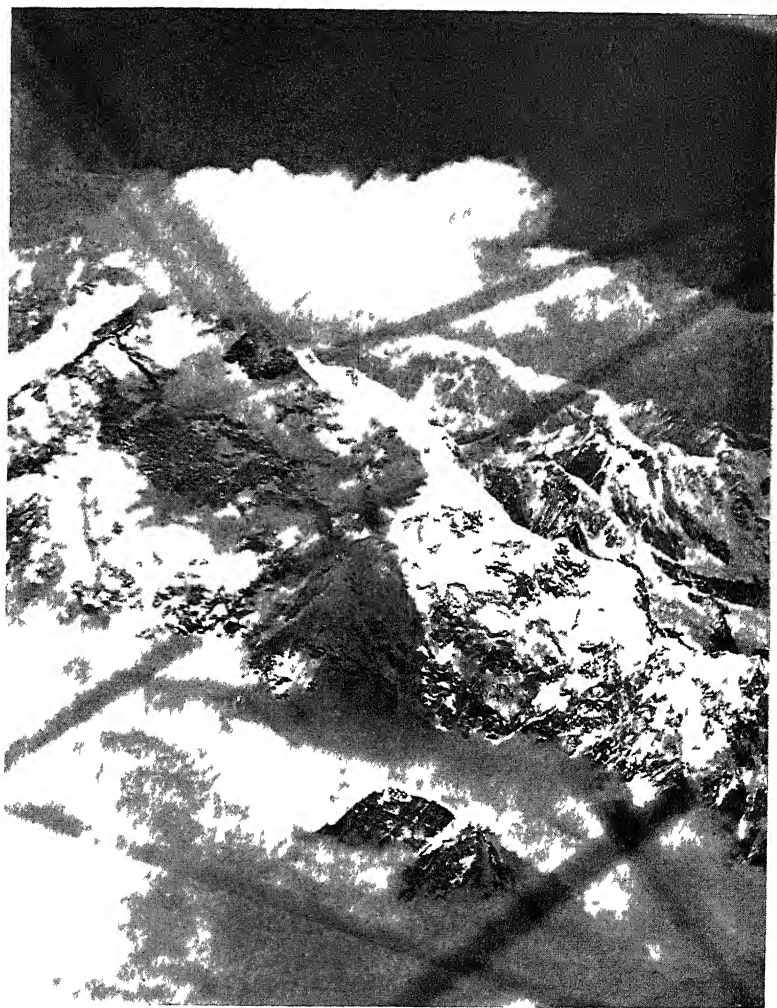
12 seconds for Zone B, and only one minute with a 6 seconds time interval for Zone C. The decrease in the time of covering the zones and the increase in the speed at which the exposures were to be made were occasioned by the obvious fact that the ground quickly rose in height, until at the end it was only a few hundred feet below us. The fourth aperture on the disc was to cover two zones, D and E, which were to be observed on the return journey after leaving Everest. It will be seen that, on calculating the number of plates exposed from the diagram, we should have used over 220 odd plates, where in reality we only exposed 125. We had calculated on using two sets of vertical plates for the strips, but found it was impossible to change them in the air.

Having worked out all these calculations before we left England and tried out the scheme on a 40-miles strip of country between Farnborough and Reading, on the same compass course as that between Komaltar and Everest, we were prevented by dust haze on 3rd April and by clouds on 19th April from using the time-schedule and zone plan. We could neither see our landmarks nor estimate our ground speed and, deprived of our automatic checks, we had to make shift. We decided to take no chances and allowed excessive overlaps. The cameras yielded nothing of value on the first flight. On the second we got two complete strips, which by a stroke of good fortune joined up at their ends. This was the only piece of sheer good luck we can claim to have had in the course of this work. Clydesdale's camera jammed at a point some five miles west of Makalu after he had completed his trip round the southern and south-easterly side of Everest. M'Intyre's camera, which ran perfectly throughout his flight over the southern face to the peak and then eastwards, exposed its last piece of film over the same point.

Had Clydesdale's camera failed a second sooner or had

M'Intyre's film been exhausted a few seconds before, there would have been a gap and it would have proved impossible to join the two strips. The whole thing on examination showed remarkably good results, enclosing a small triangle of the unknown country near Everest and giving excellent detail of the boundaries along which the two machines flew. These films were handed over to the geographical section of the War Office where, under the direction of Colonel M. Macleod and Lieutenant J. S. A. Salt, strip maps were made from them. The plotting of the climax of M'Intyre's strip presented some difficulty because the aeroplane was not flying on an even keel at the time when the four or five photographs of land near the summit of Everest were taken. M'Intyre's explanation of this fact is that, although he kept well to the west after our aeroplanes diverged, he found himself being drifted more and more to the east, and as the summit of Everest disappeared under the nose of the Wallace he altered course another 10 degrees to the left. This brought him practically up wind, yet, even so, he continued to drift eastwards.

Some of those photographs were taken, therefore, while the machine was banking and the tilt upset the perspectives as revealed by the stereoscope. The drift also carried the aeroplane over part of the plume so that some of the detail of the land beneath it was obscured at that point. Identification was helped by the oblique photographs taken by our observers on the two flights. One of these, looking from the vicinity of Makalu towards Everest, was of particular value for it showed a large part of the area covered by the few tilted verticals and supplied a mass of geographical information which cannot be found on any maps. In these sections we and our cameras had been looking down on mountain scenery which nobody else had seen at close quarters. The main peaks, it might be thought, should be easy of identification,



The Kangchenjunga Range

and in a general sense that is true; but it must be remembered that at short range the neighbourhood of Everest appears to be full of mountain tops and that any one, discerned faintly through the mist of the plume, might be mistaken for another. When it is noted, too, that on 19th April the plume was fully six miles long, the insistence of the map-makers on sound checks is readily understood.

The most valuable factor in their calculations was the common point at which Clydesdale's survey strip and M'Intyre's ended. This was almost as good as having the control point at Komaltar on both our strips. It provided a fairly certain starting point which could be approximately fixed on existing maps and from which the plotters could work backwards along our courses and set them firmly on the map. It was not quite so good as Komaltar would have been because it lay in the vast area of territory about which the map is still vague and must continue on the whole to be vague until a thorough air survey of the region is made. It served nevertheless and the map-makers were soon able to show on the existing map the courses we had flown. Their next task of making strip maps from our survey films revealed the inadequacy of the maps of the Everest region as they stand.

This was a case in which wealth of detail was an embarrassment. It was difficult to believe that so much could be missing in the maps which our strips, once set in their proper relation to the maps, showed to exist. These strips made our tracks clear. According to them, we approached Everest from the south-west, passing almost directly over the Dingboche Monastery as we came into the area of high peaks. Five or six miles farther on we began to diverge, M'Intyre heading more and more to the left while Clydesdale maintained the original course and got drifted gradually to the

east, so that it eventually became clear that he could only make the leeward side of Everest. When Clydesdale turned towards Makalu, M'Intyre evidently changed direction still more to the left and made the last piece of his flight on a course lying almost due north.

In these photographs, seen through the stereoscope, the enormous proportions of cliffs and ice faces are most impressive. Snowfields and glaciers are clearly defined. The great peaks, divided up by the camera into sections, reveal their great extent and the impossible nature of their sides. On M'Intyre's strip were two unmarked features, which were especially surprising. These were glaciers unrecorded on the maps. One was located in the position occupied on the maps by the upper waters of the Imja Khola; the other upset the geography of the neighbourhood rather more violently. This is situated to the south-east of Lhotse and was photographed after M'Intyre had turned from Everest towards Makalu. When set on the map, this glacier was found to bestride a solid ridge. The map-maker, surveying at long range, had evidently been deluded into seeing two ridges as one—a mistake which may quite easily be made in such a profusion of heights and precipices and gorges, particularly when they cannot be seen at close quarters.

One particularly interesting discovery on the same strip was a hot lake set on the very skirts of Everest. This was plotted as immediately below Lhotse II at a height of 18,090 ft. On the survey photograph this appears as a flat surface, slightly irregular in outline, at the edge of a glacier and at the foot of a sloping snowfield. The stereoscope shows it quite definitely as flat, and the absence of snow where everything else is snow and ice proclaims its temperature as higher than that of the surrounding land. It is presumably a lake of warm water, deriving sufficient heat from some volcanic source

in the bowels of the earth to prevent its freezing, yet not sufficient, as far as can be seen from the photograph, to cause clouds of vapour to condense over its surface in the cold air of minus 30 degrees C. The idea of volcanic origin is supported by the formation of the lake. The water lies in what may well have been a small crater. It is about 30 ft. above the level of the glacier, and while there is no evidence of an ice-flow into the lake from the snows above, there is proof that the lake once drained into the glacier or perhaps still overflows into it when the supply of warm water from its subterranean source is amplified by some sudden surge or upheaval in the depths of the earth.

The overflow, when it occurs, would appear to take place through a V-shaped notch in the rim of the lake nearest the glacier. The water level in the photograph is below the base of the notch, but it is evident that the water at one time stood at the level of the overflow, for there is to be distinguished an old shore line inside the crater, level with the bottom of the V. This discovery of a lake at high altitude greatly intrigued M'Intyre. He recognized in himself the explorer as well as the pilot and soon after he returned to England conceived the idea of linking his discovery with Scotland with the object no doubt of marking the share Scottish pilots had taken in the expedition.

He suggested to those who might have influence in geographical affairs that it should be named Loch Everest and so become the only loch outside Scotland, but he had not taken account either of the religious or racial feeling which makes the official application of British names to Himalayan features a delicate matter, or of the serious view taken by geographers of their duty in avoiding the use of names which might give wrong impressions to the uninformed map-reader. One expert quite seriously suggested that such a name on the map might

lead travellers to assume the existence of a Scottish colony around the shores of Loch Everest and cause them to endure hardships in the hope of reaching it.

The custom in Himalayan exploration is generally to give identification symbols consisting of letters and numbers to the principal features. Up to the time of writing, no title has been given to the warm lake. It is not, of course, a vital feature in the landscape, for it measures only about 200 ft. across, but it is a good example of the fine detail yielded by our survey strips. As has already been explained, these strips are not sufficiently comprehensive to justify any large map revision. At the greatest altitude the width of the survey is not more than 4,000 ft. Some day aeroplanes will be able to go back and forth on northerly courses to obtain lateral as well as longitudinal overlaps and so present the map-makers with a complete record of this unknown region. Our strips showed how good the photography may be in that marvellously clear air and how easily the stereoscope may work upon material which suffers a little from the steeply rising ground. They suggest that survey work over the highest mountains may be comparatively simple if the aircraft can be allowed to wait for really favourable conditions of wind and visibility. When that time comes, our pioneer experience may be of some value.

The survey work was undeniably the main aim of the pilots, but it must be remarked that the oblique photographs taken by the observers were of equal importance in their own sphere. These are the pictures which convey most to the inexpert eye, specially in those fortunate cases where two photographs of the same feature are suitable for use in a stereoscope. Some of the best are reproduced in this volume. They are eloquent of the skill of observers who had to do their work with head and shoulders exposed to the slipstream,



Infra-red photograph of the Everest Group taken over 100 miles away. The plains can be seen in the immediate foreground and the cloud layer extends from the foothills for eighty miles to the mountains.

muffled and encumbered by heated suits, oxygen masks and goggles. Something like 80 such photographs were taken in the course of the two flights. Of these 43 were chosen by the Royal Geographical Society for close examination. A selection of these was afterwards published in the society's Journal with an elucidatory article which acknowledged the special interest of photographs of "those sides of the mountain which have remained unknown to successive Mount Everest expeditions." The "hitherto unknown south-west ridge of Makalu" was mentioned and it was noted that a series of photographs taken on the return flight gave "a beautiful account of the detail between Mount Everest and Chamlang." More detailed examination was reserved and some of this work has since been done. Our pictures were used by a member of the society to make a big model in high relief of the southern aspect of Everest.

It may be said without exaggeration that our work added largely to the sum of knowledge of the southern side of the mountain and its associates. It was the first and, up to the present, the only close view of those features. In that function of revealing unknown territory lay its chief value. Others have flown higher than we had to fly for our purposes. Service officers attached to meteorological units have frequently to make high-altitude flights. There could be little merit in our emulation of such routine work unless we could bring back something of interest and something which might tend to establish the aeroplane as a survey agent over country which might have been thought impossible. Whatever others may think of our work, we were fully satisfied with the product. Also, we found little ground for criticism in the methods of the expedition. The aeroplanes and their equipment served admirably. In a future expedition it would be desirable to make changes in the clothing and other equip-

ment of the participants and in the strategy of approach to the mountain.

On the subject of flying gear we all felt rather dissatisfied. It was almost impossible to move one's head without disarranging goggles or oxygen mask, and it was easy, as the experience of M'Intyre and Bonnett showed, to displace or damage part of the apparatus. There were leads and plugs to be watched lest they got tangled or pulled out and the measure of freedom allowed to pilot or operator was very limited. It is likely also that the distribution of electrical heat might have been modified with advantage. In our opinion the pilots could have managed comfortably with less heat than they used, so that more heating might have been available for cameras and film packs. The survey and cinema cameras would probably have given much less trouble if we had been able to keep them and their contents at a steady temperature throughout the flights. As for the pilots, it is evident from M'Intyre's experiment on the second flight that, given a good windscreen, goggles and heavy helmet are possibly unnecessary.

Had we known as much about weather conditions as we know now, we should certainly not have chosen Purnea as our base, nor should we have been content to ask the Nepalese Government for a simple permit to fly to and from Everest on the direct route from the nearest suitable point in British India. We should have sought permission to operate from a main base much farther to the west and quite close to the Nepal frontier, though a suitable site might easily have been found inside Nepal if the Government could have been persuaded to agree to our using it. Then we could have made our northerly courses and our climbs well to the windward of Everest and have come down the magnificent line of Himalayan peaks with the wind. Using this method, it might have been impossible to try to beat back to our main base after

the flight, but it would have been a simple matter to arrange a refuelling base to the south-east of the hill country and so to have returned roughly along the line of the Nepal frontier at low altitude to our main aerodrome. In a scheme of that sort we should have been saved much difficulty and anxiety; we should have been able to explore a much greater area of Himalayan territory and we should have been much less hampered in our choice of a day for the attempt. There were many bright clear days when the wind was high, on which we might have done all we had planned on a down-wind course.

An alternative method of overcoming the persistently strong west wind would be to use faster aircraft. At the time we made our flights, the Westland aeroplanes were the best we could find for our purpose. There were faster machines, but it is doubtful whether they could have carried the heavy loads or whether their water-cooled engines would have continued to yield the necessary power at a height of 35,000 ft. To-day it is possible to obtain single-engined machines which are 30 miles an hour faster than those we used. If twin-engined aircraft could be used, the pilot might rely on an extra 50 miles an hour and, by lightly loading them, might be fairly certain of reaching the required height. If such aircraft had been available when we left England, we could not have afforded their first cost and we should have found them more expensive to ship and to operate. The amount which was actually spent on our expedition was about £19,000. A good deal of that was recovered in various ways, but when we set out there was no guarantee of the success which ultimately represented revenue to the committee and we could therefore not contemplate adding to our expenses.

Some day Everest will be flown over again and within a few years it will perhaps be difficult to believe that our first

effort involved all the care, forethought and persistence recorded in this account. It is only just to add that we were not unduly oppressed by the precautions we considered it wise to take in planning a flight over unknown country. Our objective seemed worth the trouble and, when once we had defined the needs, our task resolved itself into a routine which was, subject to modifications, to meet the changing conditions from day to day. Having set the work reasonably in order, we found our labours pleasant enough and there was just sufficient risk and uncertainty in carrying out the flights to stimulate us in the most difficult circumstances and to stiffen us when times were most discouraging.

This was an adventure we all enjoyed. If it were possible to repeat it, there is little doubt that every member of the original party would volunteer for service again. And, indeed, it would be hard to find a more efficient band. To that fact we owed our successes and to the admirable spirit of the members we owed the harmony and good humour of the mess at Purnea. It is pleasant to think that there was no serious casualty and no important disagreement among us throughout the expedition. The party has met as a whole only once since it was disbanded in India. It may never be possible to reassemble it again, yet it is bound together by the memory of a common life and effort in a task which has no counterpart in the history of British flying. To the pilots, the recollection of Everest is at once romantic and a little unreal. Something of the mystery has been overcome and something of the unknown has been revealed; yet the Mistress of the World remains remote, immense and magnificent. The best that we could bring back was but a faint impression of her dignity and beauty.

CHAPTER XI

HIGH ALTITUDE FLYING

High flying opens up a fascinating prospect. It is not that anybody seriously contemplates a journey to the moon or that there is any particular intrinsic merit in reaching great heights. The continuous raising of height records by aeroplanes and stratosphere balloons may be spectacular as one success follows another, but these flights are not undertaken for that purpose. They may be called the flights of exploration and experiment which will some day put the upper air at the disposal of air transport and will so raise its efficiency. The time will come when on long journeys the aeroplane, flying at a height of 50,000 or 60,000 ft., will gain fully 100 miles an hour in speed as compared with the performance it could show at lower altitudes. The result of that will be to allow more pay load to be carried on long flights and will enable the aeroplane to offer still more valuable service to the passenger who has little time to spare.

It may be argued that if flight at a height of 60,000 ft. is to become possible, there need be no insuperable difficulty in going much higher. In fact, the difficulty is likely to increase so much at greater heights that progress will be slow. The density of the air, on which the whole problem depends, is progressively diminished, so that the mechanical achievement which may suffice to carry an aeroplane to a height of 60,000 ft. might have to be intensified 400 times to obtain similar efficiency for it at a height of 200,000 ft. Up to the present no aeroplane has topped the 50,000-ft. mark. It may not be long before that success is won. When that happens, the aeroplane may be said to have reached the stratosphere—

that part of the atmosphere in which the temperature tends to rise with altitude. Progress beyond that stage will be laborious unless it should prove possible to apply a new type of prime mover to the aeroplane.

During the next few years the aeroplane designer is not likely to contemplate a higher altitude for general operational purposes than 40,000 ft. If he can produce an aeroplane which may fly easily and safely at that height, he will have presented commercial flying with a large increase in speed for flights of such lengths as may justify the long climb. Some theoretical figures worked out in 1935 for an aeroplane of high efficiency with engines supercharged to maintain full power up to 30,000 ft., give a striking example of the advantages which high-altitude flying may offer. This aeroplane, using 800 horse-power, might carry three passengers for a distance of 2,500 miles at a speed of 197 miles an hour at sea level. At a height of 40,000 ft. it might carry five passengers at a speed of 296 miles an hour with the same range of operation in still air.

At the heart of this calculation is the presumption, so far unrealized, that full power could be maintained by supercharging up to a height of 30,000 ft. The supercharged Pegasus engines used on the flights to Mount Everest gave only a fraction of their power at high altitude. Captain C. Uwins, when he made his record climb to 44,000 feet in 1932, was getting at the top of his climb only about 120 horse-power out of his 650 horse-power engine, highly supercharged though it was. The diminution in the density of the air, which is nearly enough represented by the diminution in atmospheric pressure, presents the main problem to the engine manufacturer, the aeroplane designer and the pilot. The temperature troubles are less important, as our own experience has shown. No member of the Expedition suffered any

marked discomfort from cold in the course of our climb to 36,000 ft., although the temperature was down to -45 degrees C. At greater heights it might have fallen to -55 degrees C, but neither the crews nor the engines would have been seriously troubled by a fall of an extra 10 degrees.

The main question in all projects for high flying is that of overcoming the disadvantages of thin air and low pressure. The physical problem this presents is fairly well known. Unless a nearly constant pressure of oxygen is maintained in the blood, efficiency will be impaired and ultimately life will cease. Three members of our Expedition at least had some experience of the unpleasant effects of lacking oxygen, and our criticism of the unsatisfactory apparatus which had hitherto served to supply oxygen to the human body at great height has already been stated. The oxygen mask is uncomfortable and may be rendered partially ineffective if the head has to be exposed to the slipstream. It suffers also from the disadvantage that it must allow for the escape of the impure air exhaled from the lungs, which means that some of the oxygen it delivers must also escape. The idea of supplying oxygen to the body at a pressure equivalent to that of lower altitudes is therefore impossible in existing circumstances and, as the air becomes thinner and thinner, so the oxygen pressure in the mask tends to become lower. The result is that the nature of the makeshift equipment such as we used sets a limit to the height which may safely be reached without further precautions.

That height limit was estimated before the more recent flights as being about 42,000 ft. Captain Uwins, who went to 44,000 ft., and Commendatore R. Donati, who went to 47,360 ft. with the help of this apparatus, showed that in exceptional cases this limit might be exceeded. It should, nevertheless, be stated that the Italian pilot was in a state of collapse when

he descended. The oxygen mask appears at last to have given the pilot as much help as can be expected of it. For the next advance something capable of delivering oxygen at a reasonably high pressure is needed, and the probable line of progress is to be seen in the high-altitude balloons which Belgium, the United States and Russia have built and sent some 20,000 ft. higher than any aeroplane has yet been able to fly. The crew in these cases were accommodated in air-tight chambers equipped with apparatus for supplying oxygen at a given pressure, for preserving an even pressure inside the cabin and for extracting carbon dioxide and moisture from the atmosphere of the cabin.

The method of dealing with the altitude problem may appear to be concerned as much with pressure as with the supply of oxygen, and it might therefore be regarded as supporting the old idea that the preservation of mechanical pressure is essential to avoid the disintegration of the body at great heights. The belief held for many years was that with diminishing pressure at very high altitude the blood vessels and other organs would expand and that their walls would eventually burst with fatal results. This theory was scientifically assailed by the late Professor J. S. Haldane just after the War in his book on respiration, and although the net effect is still to require the hermetically sealed container for the pilot and his supply of oxygen, it is interesting to note that the vital point is not mechanical pressure but the pressure of the oxygen content of the blood. As an alternative to the air-tight chamber, it is thus possible to use an air-tight suit capable of withstanding only a moderate internal pressure.

Dealing with the question of the equalization of pressures, Professor Haldane made the following blunt statement: "It is commonly supposed that the increased pressure on the skin

must at first tend to drive blood into the internal organs, producing congestion of the brain, &c., with a converse effect on diminishing the atmospheric pressure. The pressure is, however, transmitted instantly through all the liquid and solid tissues of the body so that this idea was totally fallacious and indeed ridiculous." Mechanical pressure, he said ~~out~~ right, is immaterial. The present limitations in high flying are due entirely to the physiological effects of reduced oxygen pressure and the imperfections of the apparatus used for overcoming these effects.

He made it plain that oxygen must be breathed continuously at high altitudes and that the airman who takes several breaths of the outer air at great height will be much nearer danger than a miner, using the self-contained breathing apparatus, would be if he took several breaths of an atmosphere of fire-damp. Yet he insisted that "the problem of going to very high altitudes with an oxygen apparatus is similar to that of using a self-contained breathing apparatus in mine air which is either intensely poisonous or contains little or no oxygen." He stated his case for high flying briefly and explicitly as follows: "To go much above 40,000 ft. and to a barometric pressure below 130 mm. it would be necessary to enclose the airman in an air-tight dress somewhat similar to a diving dress but capable of resisting an internal pressure of say 130 mm. of mercury. This dress would have to be so arranged that even in a complete vacuum the contained oxygen would still have a pressure of 130 mm. There would then be no physiological limit to the height attainable."

Following Professor Haldane's dicta, a diving suit for the upper air was made in 1934, and a young American, who was contemplating an ascent into the stratosphere in a balloon with an open basket, submitted himself in such a suit to a

test in a pressure chamber in London. The pressure was reduced to the pressure appropriate to an altitude of 90,000 ft., and the subject of the experiment emerged none the worse from the chamber. With heated clothing such as we used over Mount Everest and a pressure suit, the human frame would seem to find all the protection it needs for flights far into the stratosphere. The risk of accident due, for example, to a leaking gland or a faulty seam would appear to be rather less in the case of the stratosphere suit than in the air-tight cabin from which control cables and rods must pass into the outer air.

Oxygen pressure may be maintained. Loss of heat from the body may be prevented. Purification and drying of breathed air may be achieved. But there will probably be other troubles to overcome as high flying becomes more ambitious. The temperature inversion, which begins at a height of about 50,000 ft., is thought to be continuous, so that ground temperature may be found at 160,000 ft. and still higher temperatures at greater heights. It does not yet appear certain whether or not cosmic rays might cause additional troubles. Their power of penetration is great and increases with height. The big balloon which went up from South Dakota in 1934 carried an electroscope which was surrounded by six inches of lead to test the changing power of the rays as the balloon passed through the layer of ozone which filters the more violent rays of the sun and prevents their reaching the earth in the form in which they might be harmful.

Whatever may prove to be the fact in these matters of protecting the human body against the possible ills that await it in the stratosphere, it is plain that none of the questions will arise in acute form until mechanical ingenuity makes it possible for human beings to travel in these rare atmospheres. Balloons may be able to rise to great heights and will con-

tinue to contribute information necessary to the navigation of the upper air, but it is only when those layers of the atmosphere become a medium for serious transport that they will bear any important relation to flying affairs. The aeroplane has first to be got up to great heights and must be capable there of performing its normal functions. At the root of the question, therefore, remains the engine which supplies the power. Even if it should become possible some day to build a high-altitude airship, there will still have to be an engine capable of yielding a big percentage of its power output in thin air. In the early stages of high-flying development the petrol engine will have to serve. Its limitations must be overcome and in this matter a variety of considerations arise:

The decline in the density of the atmosphere deprives the engine of the ability to do its work quite as certainly as it incapacitates the human being, but the reduction in engine efficiency is more gradual so that the problem is only partly one of supplying adequate oxygen to the engine and partly that of striking a compromise which will allow some percentage of the total available power to be put to the most useful purpose. The point which demands attention first is that of making good the density deficiency by compressing the air which is fed to the engine cylinders. When we made our flights over Everest, the best supercharger which could be obtained for an aero-engine gave a compression of about two to one. That meant that full power might be maintained up to a height of about 20,000 ft., subject to certain variations due largely to temperature, and this shows very clearly how much more progress must be made to persuade an engine to yield full power at 50,000 ft., where the air pressure is only about one-ninth of the pressure at sea level.

It is also to be noted that compression involves a rise in the temperature of the air compressed. The temperature rise

which occurs in compression of the order of two to one is nearly 100 degrees C., and the question of dissipating the heat thus generated, so that carburation may not suffer, is one which becomes progressively more awkward on account of weight considerations, the higher the aeroplane goes. Another small point exists in the fact that superchargers have generally to be driven through gears from the engine and so deprive the airscrew of some small part of the power which is so vital to it at high altitude. It must further be remarked that the superchargers which we used, and which were almost the only ones which could be used at that time, took the form of the centrifugal fan which threw off air from the tips of the blades at high speed into a diffuser where its energy was converted into pressure. The rate of such a fan might exceed 30,000 revolutions a minute. The danger that the tip-speed of the fan blades might reach a speed higher than that of sound made it difficult to contemplate either an increase in the size of the fan or a raising of the speed at which it works. The solution of the supercharger problem appeared thus to depend on a multiplication of superchargers or upon the development of a new type of compressor.

The idea which has held the field up to the present is that of using two or three superchargers coupled in series. The effect of this method is to compress the air in two or three stages, passing it on from one supercharger to the next. Three principal objections have to be overcome in this instance. The addition of superchargers means an addition of weight and of mechanical complication. It also means taking a bigger percentage of power from the engine for the service of the superchargers. Finally, the high compression creates a large rise in the temperature of the air and makes it imperative to arrange a cooling system for the air before it passes into the induction system. In the last two or three years it

has been possible to contemplate the extra weight because the ratio of engine weight to power has been improved through the use of doped fuel and the higher compression ratios permitted by it. The desire to reserve for the airscrew all the power the engine can produce has been served by a plan for driving the superchargers with the power of the exhaust gases.

This is not so simple a matter as might appear. It is to be remembered that these gases come to their new purpose at a very high temperature. The turbine which they will drive must therefore be capable of withstanding great heat—as much perhaps as 700 degrees C.—as well as be able to operate at a high rate of revolutions. This aspect of the question seems unlikely to be tackled in the attempts on the stratosphere which are in prospect at the time of writing. The troubles which would have to be met make it more probable that for the present the engine will be required to supply direct the power for supercharging up to the point at which gain from compression of the air will be offset by the power needed to drive the extra superchargers. The cooling of the air before it reaches the carburettor inlet should not present serious difficulties after all the experience which has been gained with radiators, salt-cooled valves and the like. With the help of the technique of chemical refrigeration it should be possible with fairly compact apparatus to reverse the radiator process of putting heat into the air. This is nevertheless one of the vital points of the system. Without a reduction of the inlet temperature, detonation troubles would be met which no special fuel could prevent.

From this it is obvious that the engine itself will need special attention. The thinness of the air which demands supercharging with all the additional problems which that process brings in its train, also affects the important question

of cylinder temperatures. Upon the density of the air depends its ability to carry away the excess heat from the cylinder fins or the radiator. The higher the aeroplane goes the greater the volume of air which must make contact with the cylinders in order to carry away the unwanted thermal units generated within them. The fact that in level flight the aeroplane will be travelling faster helps to ease this problem, but this modification does not begin to apply until the machine has reached its operational height. Throughout the climb, cooling conditions are getting worse and the oil temperatures are rising. It thus becomes necessary to supply cylinders with a greater fin area so that adequate cooling may be obtained. This subject has had to be dealt with already in more ordinary operation. With the help of leaded fuel and afterwards of fuel containing iso-octane, the power output of a given cylinder capacity has been nearly doubled, and the extra heat has been dissipated by giving the air-cooled engine a much greater fin area and by improving the material of which cylinder heads are made. Deeper fins and fins more closely arranged have been made to increase the area of radiation without increasing the over-all size of the engine. That process does not appear to have exhausted its possibilities. In liquid-cooled engines the matter is far less easy because of the liability of most fluids to boil at low temperature when pressure is diminished.

The low temperatures of the atmosphere which must carry away the heat, help only in a limited degree. It has already been seen that the temperature of -45 degrees C., in which our machines worked over Everest, is within 10 degrees of the minimum temperature likely to be met on a climb into the stratosphere. That small reduction will do little to counteract the decreased density of the air at greater height. The heat must be removed by allowing the air more opportunities to

get at the surfaces from which it is radiated. Nor is the low temperature of the air by itself likely to upset the oil and fuel. Our own experience showed that petrol and oil specially prepared for the work need take no harm in conditions of extreme cold. Subject to efficient supercharging, the petrol may be satisfactorily carburated and the oil will not freeze in its tank if this is duly protected. Low temperature is less to be feared than low pressure. The petrol must be proof against boiling and the oil must be of a quality which will not begin to break down in conditions of partial vacuum allied with heat. Such a set of conditions might easily occur if high cylinder temperatures were combined with low atmospheric pressure in the sump.

Much knowledge on these subjects has been steadily acquired by the oil companies and the engine manufacturers. On the first excursions into the stratosphere the trouble on these heads should not be serious, but when ambition carries the pilot up into the rarer altitudes these matters may constitute big obstacles. At some remote time the whole subject may become revolutionized by the introduction of an engine of different characteristics. The Russians are already talking about using steam compressors and steam turbines served by oil burners. These, too, would suffer badly above 50,000 ft., though they would be free of the additional problem of preventing the leaking of electricity in conditions of low pressure from which the ignition system of the petrol engine might conceivably suffer. If the internal combustion engine should eventually succeed in dragging itself up to great heights, the question of supplying it with fuel might actually solve itself. The increase in supply of hydrogen in the air might result in the aeroplane finding all round it free fuel at a height of about 200,000 ft.

At all events it is clear that the engine is the real key to

the problem of high flying. For some years the engine must continue to be the limiting factor. Reinforced by the assurance of Professor Haldane that, given proper apparatus for preserving the pressure of oxygen in the blood, there need be no limit to the height to which man may climb, man will doubtless consider it worth his while to concentrate on securing for the engine a like measure of protection. That the technical and mechanical problem is much more complicated than the physiological one will not deter the experimenter and the engineer from pressing on with this work. The pilot and ultimately the passenger can be put into an air-tight cell with a supply of oxygen and left in comparative safety while the engine goes on to the limit of its powers. The comparative simplicity of this part of the task has been illustrated by the high-altitude flights of the big balloons. The gas-bags of these balloons have given trouble, as in the case of Professor Piccard when the descent was too rapid, or in the case of the American expedition when adhesions caused the lower part of the bag to tear, but the gondolas have not leaked or burst or even been pulled out of shape by the inequality of the pressures within and without. The question of air-tightness and of arranging for the reconditioning of the air inside has not yet presented itself as hard to resolve, although in the cases of the balloons provision had to be made for controlling the valve from within the gondola and for discharging ballast through a hopper made on the principle of an air-tight valve.

Much the same principles apply to the fuselage of the high flying aeroplane, but they have to be made to meet a more complicated set of circumstances. Were passengers the only consideration, the matter would be simplified, but the pilot also must be included in the scheme of things, and from the pilot's cockpit must be led out into the thin air the control rods and cables which serve the aeroplane. At some point

the aileron, elevator and rudder controls must go out of the air-tight chamber, the engine throttles and the supercharger controls must be led out, and the tubes and shafts which record speeds, revolutions and temperatures must be brought in. All these things must be carried through air-tight glands, and a leakage in any one would mean disaster. Here the problem of air-tightness presents itself in an acute form, so acute indeed, that Mr. Anthony Fokker, long skilled in overcoming apparently insoluble problems, ended a discussion recently with the remark that it would be simpler to put a valve into each of the passengers than to make an aeroplane in which they could live comfortably during a flight in the stratosphere.

Here again the work will go on gradually and at the cost of courageous effort by the pilots. One life has already been lost in the attempt to produce an air-tight fuselage. The Farman 1001, which was intended for very high-altitude work, failed for some reason to stand the strain, and the pilot on a test flight was killed. At the time of writing the new high-altitude machine of the Bristol Company is nearing completion and should begin its tests soon after this book appears. The stratosphere suit and not the airtight cabin will have to serve the pilot on this attempt. In other countries, the United States, France, Italy, and Russia, work is being done in this line. Experiments will eventually produce a satisfactory result and it may not be long before the operation of the less critical altitudes is at the full disposal of the aircraft operator. The advantages to be gained from it are great enough to make the effort worth while, and mechanical invention, designed to serve other ends, promises to give this movement additional assistance. For example, the old idea that the stratosphere aeroplane must have a long-legged undercarriage in order to

allow ground clearance for the very big airscrew necessary to get a grip on the thin air at height, has been abandoned since the arrival of the variable-pitch airscrew which will allow fine pitch and high revolutions for the take-off and climb and a coarser pitch for cruising at high altitude.

As was remarked at the end of 1935 by Professor G. T. R. Hill, it would be an excellent thing if the airscrew could be supplied with additional blades as the density of the air is reduced, so that the two-bladed screw should become a four-bladed screw at 20,000 ft. and a six-bladed screw at 30,000 ft. For the present that is quite outside the bounds of technical ingenuity, but it may not always be. The Italians have run two airscrews on two concentric shafts and the idea of sliding an extra airscrew into position on a driving shaft at a given height may not appear fantastic in the years that are ahead. At the present time the world stands at the threshold of high flying. For passenger purposes nothing of any significance has yet been done in that direction. The custom of certain European and American companies in making their passenger journeys at a height of 12,000 ft. yields an advantage in speed and economy by allowing the engines to work at the height at which, with a certain measure of supercharging, they give their best output. What the operator would like to be able to do is to take his passengers on the long flights which are about to become normal, up to a height of 40,000 ft. When he can do that, he will have taken an important step towards making long ocean journeys possible at a reasonable cost.

There has been much speculation as to the probable effect of winds at great height. The original belief that very strong westerly winds would be found far up in the stratosphere led to the conclusion that the upper air would in effect become a one-way traffic lane, taking aircraft always in an easterly direction as the quickest way to any place. This arose from

the assumption that the earth, turning on its imaginary axis from west to east carried a powerful stream of its atmosphere with it. Up to a point this assumption is justified. It is also evidently true that in some parts of the world there are westerly winds of high velocity. At 50,000 ft. they may reach a speed of 200 miles an hour. At the modest height of 35,000 ft. near Mount Everest we met a wind of 120 miles an hour on our second flight. It is also clear that at some times comparatively light winds are found at high altitude. The American stratosphere balloon which rose to a height of 60,000 ft. in 1931 and the second one which reached 70,000 ft. the following year, both made a leisurely progress across country at an average speed of about 30 miles an hour. None of the other high-flying balloons has found signs of the big winds which those who previously discussed the stratosphere had expected to find. It is only fair to add that all these experimental balloon ascents have been made in fine weather. The worst of the weather that may be met at great altitude may not be determined until frequent exploratory flights can be undertaken by high-flying aeroplanes.

It is at least certain that when the aeroplane can go high into the atmosphere, maintaining its engine power and protecting its pilot and passengers, it will offer great advantages. Drag will be greatly diminished in the thin air and, other things being equal, speed must therefore be increased. The calculations made by Professor G. T. R. Hill in 1935 showed how prolific in benefits this fact might be. He based his theory on the qualities of the de Havilland Comet, which won the England to Australia race in 1934. That was a machine of very low drag and he showed how still further reduction of the induced drag by the use of a high aspect ratio (the ratio of span to chord) might be obtained. Taking a machine of a loaded weight of 9,000 lb. and an engine

output of 800 horse-power, he showed that with a span of 48 ft. and an aspect ratio of 6.4, loading the wings at the rate of 25 lb. to the square foot, a speed of 193 miles an hour at sea level might be raised to 277 miles an hour at 40,000 ft.

Taking the same machine but increasing the wing span to 62 ft. and the aspect ratio to 10.6, a speed of 197 miles an hour at sea level might be increased to 296 miles an hour at 40,000 ft. In such a machine the crossing of the Atlantic with five passengers might be accomplished in less than seven hours—an achievement in speed and economy which cannot be offered by any aeroplane at present. Still higher speeds might be expected at greater heights, and with every increase in speed which has not to be paid for too heavily in the weight of extra superchargers, the amount of petrol which has to be carried for a given journey is decreased and the pay-load may be raised. The prospect, up to the point at which speeds begin to approach the speed of sound (about 700 miles an hour), is very attractive and the work which is being done towards making high flying possible will some day be well repaid.

The modest adventures of our expedition in the upper air were not intended to be experimental in any of these senses. We did not seek to push man's flying achievements to record heights. We desired to employ the knowledge of high flying which had already been gained so that we might do a piece of serious survey work over the highest point on the earth. In that aim we succeeded, and though we learned things which may be useful to others who have a similar task to do, we did not intend to gather information which might be used directly to help forward the work of the pioneers of stratosphere flying. Just as few pieces of unfamiliar work can be undertaken without revealing some things besides those which they set out to accomplish, so we may claim to have contributed our mites

to the sum of human knowledge. The heights at which we worked are roughly the heights at which commercial aviation will probably begin to attempt to operate.

We satisfied ourselves that quite serious work and hard thinking may be done by human beings at those heights with the more primitive apparatus for the preservation of human life and efficiency. M'Intyre's trial of his own flying helmet and simplified oxygen mask and his discarding of goggles showed that some of the fetishes of high-altitude flying have no sound foundation. We formed our own opinions about the apparatus which served us and about the improvements which might, without difficulty be made in it. When a serious effort is made to apply this sort of flying to the needs of commercial aviation our small contribution may be acceptable in the great fund of knowledge on which the technique will be based.

APPENDIX

IMPORTANT PEAKS IN THE HIMALAYAN RANGES

<i>Peak</i>	<i>Range</i>	<i>Height</i>
Everest	Nepal Himalaya	29,002 feet
K 2	Karakorum	28,250 "
Kangchenjunga	Nepal Himalaya	28,146 "
Lhotse	" "	27,890 "
Kangchenjunga II	" "	27,803 "
Makalu	" "	27,790 "
Dhaulagiri	" "	26,795 "
Cho Oyu	" "	26,750 "
Kutang I	" "	26,658 "
Nanga Parbat I	Punjab Himalaya	26,620 "
Annapurna I	Nepal Himalaya	26,492 "
Gasherbrum I	Karakorum	26,470 "
Broad Peak	"	26,400 "
Gasherbrum II	"	26,360 "
Gosainthan	Nepal Himalaya	26,291 "
Gasherbrum IV	Karakorum	26,180 "
Gasherbrum III	"	26,090 "
Annapurna II	Nepal Himalaya	26,041 "
Gyachung Kang	" "	25,910 "
Dasto Ghul	Karakorum	25,868 "
Himalchuli	Nepal Himalaya	25,801 "
Kang Bachen	" "	25,782 "
Ngojumba Kang	" "	25,730 "
Kutang II	" "	25,705 "
Nuptse	" "	25,700 "
Masherbrum East	Karakorum	25,660 "
Nanda Devi	Kumaun Himalaya	25,645 "
Ghomo Lonzo	Nepal Himalaya	25,640 "
Masherbrum West	Karakorum	25,610 "
Nanga Parbat II	Punjab Himalaya	25,572 "
Rakaposhi	Haramosh Ridge	25,550 "

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<i>Peak</i>	<i>Range</i>	<i>Height</i>
Hunza-Kunji I	Karakorum	25,540 feet
Kunjut No. 1	"	25,460 "
Kamet	Zaskar Range	25,447 "
Namcha Barwa	Assam Himalaya	25,445 "
XLIII	Nepal Himalaya	25,429 "
Sherpigang I	Karakorum	25,400 "
Gurla Mandhata	Nepal Tibet Watershed	25,355 "
Jano	Nepal Himalaya	25,294 "
Hunza-Kunji II	Karakorum	25,294 "
Sherpigang II	"	25,280 "
K 22	Sasir Ridge	25,280 "
XLIV	Nepal Himalaya	25,271 "
Tinch Mur I	Hindu Kush	25,263 "
B 504	Nepal Himalaya	25,134 "
Makalu II	" "	25,120 "
Chogolisa	Karakorum	25,110 "
Satellite of Dhaulagiri	Nepal Himalaya	25,064 "
Kungur	Muztagh Ata	25,046 "
Chamlang	Nepal Himalaya	24,012 "
Gauri Sankar	" "	23,440 "
Pumori	" "	23,190 "

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